

**MAIN FILE**

January 9, 2009

The Dow Chemical Company  
P.O. Box 150  
Plaquemine, Louisiana 70765-0150

**HAND DELIVERED**

Bijan Sharafkhani, P.E.  
Administrator  
Office of Environmental Services  
Louisiana Department of Environmental Quality  
P.O. Box 4313  
Baton Rouge LA 70821-4313

original to IOHW  
SM  
copy to Eng/Caffery

The Dow Chemical Company, Louisiana Operations  
Solvents EDC 1 – Comprehensive Performance Test Plan  
✓ Agency Interest No. 1409; EPA ID No. LAD 008 187 080

Dear Mr. Sharafkhani,

Dow submitted a response to a request for additional information and an updated HWCMACT CPT Plan on August 1, 2009. This plan is for a repeat of the 2005 CPT as well as to demonstrate compliance with the HWCMACT incinerator replacement standards.

On November 12, 2008, Dow received an additional letter from LDEQ dated November 5, 2008 requesting additional information and an updated CPT plan within 60 days. Dow has also been in verbal discussions with the agency concerning several items being addressed in this request.

Enclosed are three paper copies and one electronic copy on CD of the NOD response and of the updated CPT plan.

If you have any questions pertaining to this communication, please do not hesitate to contact me at (225) 353-1842.

Respectfully,

Lisa Perry  
EH&S Department  
The Dow Chemical Company

Enclosures

CC: Kishor Fruitwala (EPA Region 6)

DEQ - OES  
2009 JAN - 9<sup>th</sup> AM 8:32

**DOW CHEMICAL COMPANY (PLAQUEMINE)**  
**LAD 008 187 080; AI #1409**  
**RESPONSE TO Request for Additional Information**  
**SOLVENTS/EDC I (F-700) INCINERATOR**

<b>Regulation</b>	<b>Comment</b>
40 CFR 63.1207(h)(2)	Maximum feed capacity is currently limited to 5,000 lbs/hr per the August 28, 2007 letter (EDMS # 36227930). Dow is advised that operations at a higher feed capacity (Condition 2) would be allowed only during the 720 hours (renewable upon approval) after the CPT plan is approved and before the CPT is performed.
<b>Dow Response</b>	<b>Dow is aware of the 720 hour allowance for testing and acknowledges this comment.</b>
40 CFR 63.1207	Dow must further explain in the CPT the basis for the waste feed matrix chosen for Condition 1. For the 9 month period from 1/1/04 to 9/30/04 Dow reportedly burned 9,744,104 lbs of "Hexes" waste, which represented approximately 70% of the total liquid waste fed to the TTU. "Hexes", which are solid at room temperature, would reasonably be difficult to inject and incinerate. However, this waste stream comprises only 18% of the Condition 1 waste feed matrix. Dow must propose a waste stream feed mixture that represents worst case conditions.
<b>Dow Response</b>	<b>Due to the difficulty in feeding the "Hexes" waste stream, Dow is concerned that multiple trips would compromise the integrity of the test due to interruption of operations during testing. Though difficult to inject, the HEX waste stream is not difficult to burn, and since the POHC is being used to determine the DRE, Dow does not see the necessity of burning high rates of Hexes during the test. Dow has agreed in prior conversation with LDEQ to increase the "Hexes" waste feed rate to 1,500 lb/hr from the previous 1,000 lb per hour. Section 4.3.1 of the CPT has been updated to include language to address this. Table 4-3 and Table 6.1 have also been updated to reflect the new feed rate.</b>
40 CFR 63.1209(o)(3)(v)	For both the Absorber C-720 and the Scrubber C-730 Dow "must establish limits on either the minimum L/G ratio or the minimum scrubber water flow rate and maximum flue gas flow rate on an hourly rolling average (HRA) as the average of the test run averages". Per conditionally approved alternative monitoring application (AMA) requests # 2 and 3, the facility must demonstrate a minimum liquid flow rate L, HRA with automatic waste feed cut off (AWFCO), for Absorber C-720 and Scrubber C-730 as a alternative to both a liquid feed pressure limit and a minimum blowdown rate. The facility must also demonstrate a minimum L/G ratio for both units during Condition 2 (max feed rate and max flue gas flow rate). Minimum feed water rate L and L/G from both units will be established as the average of the comprehensive performance test run averages of Condition 2.
<b>Dow Response</b>	<b>Table 4-1 of the CPT has been updated to include these requirements.</b>

40 CFR 63.1209(l)(v) Dow's response to DEQ's May 20, 2008 comment is unacceptable. The mercury feed rate operating parameter limit may be extrapolated up to three times the highest historical feed rate, based on CPT demonstration results, but not up to maximum stack emission (permanent replacement) standards. The CPT plan must be revised accordingly. Documentation of historical feed rates must be included with Dow's extrapolation methodology.

**Dow Response** Section 4.7 and Tables 4-1, 4-2, and 4-2 of the CPT will be updated to include these requirements.

40 CFR 63.1209(n)(2)(vii) Dow's response to DEQ's May 20, 2008 comment is unacceptable. The mercury feed rate operating parameter limit may be extrapolated up to three times the highest historical feed rate, based on CPT demonstration results, but not up to maximum stack emission (permanent replacement) standards. The CPT plan must be revised accordingly. Documentation of historical feed rates must be included with Dow's extrapolation methodology.

**Dow Response** Section 4.7 and Tables 4-1, 4-2, and 4-2 of the CPT will be updated to include these requirements.

40 CFR 63.1209(g)(2) Dow must propose an Operating Parameter Limit (OPL) with an automatic waste feed cut off, on the "cell effluent" (dilute caustic) flow to the chlorine scrubber, C-730, to ensure total chloride emissions do not exceed permanent standards. The previous CPT (Condition 2) failed on total chloride emissions, and according to data from that test, the "Cell effluent" (dilute caustic) flow dropped consistently across all three runs (8,073 lb/hr, 7,205 lb/hr, and 6,957 lb/hr avg flows respectively. Since target operating parameters, including pH, were maintained but chloride emissions, to ensure sufficient removal of chlorine at max chloride feed condition. The CPT plan must be revised to include this.

**Dow Response** While Dow recognizes the issues associated with the 2005 CPT concerning Cell effluent flow, and that the agency has the authority to impose additional requirements, there are numerous concerns in establishing minimum flow on caustic to the incinerator. The quantity of Caustic required in this unit is directly dependent on the amount of chlorine in the waste feed. Having an absolute minimum on caustic flow may result in excess caustic feed to the scrubber which may cause other problems such as fouling. Despite the problems with the previous test, Dow still feels pH is the best indicator of performance of this unit. However, for the 2009 CPT, Dow is willing to propose the addition of a minimum ratio of cell effluent HRA to chlorine feed. Section 4-2 Tables 4-1, 4-2, 4-3, and 4-4, 5-1, and 5-2 have been updated to reflect this proposal and additional parameter.

CPTP, Section 4.5 Considering history of the May 2005 CPT Condition 1 data, steady-state conditions for the CPT must include a variability limit for the C-720 absorber differential pressure to  $\pm 50\%$  between high and low DP pressure readings over 5 minutes. The CPT plan must be revised on include this.

**Dow Response** Section 4.5 of the CPT has been updated to include this requirement.

CPTP, Section 6.3	Condition 1 feed rates in Table 6-1 (i.e.) Hexes and Carbon Tetrachloride must agree with feed rates in Table 4.3. Review of Condition 1 data from the 2005 CPT suggests that Table 4.3 is in error. The facility must correct whichever table is erroneous in the CPT plan.
<b>Dow Response</b>	<b>Table 4.3 has been corrected.</b>
Performance Evaluation Test Plan	Considering history of the May 2005 CPT and subsequent modifications to the unit (new air blower, variable speed drive, flue gas recirculation line, and 2 gas flow meters in ports A and B respectively, Dow must demonstrate acceptable performance of stack gas flow meters over a range of flow gas rates according to EPA Performance Specification #6 prior to performing the CPT. Previously submitted results (5/12/06 test event by B&T, higher flow rate condition) showed a greater than 20% difference between Flow #1 and Flow #2. The PETP must be revised to include this procedure. Dow must demonstrate acceptable performance for both meters if they are to be used (primary and backup) for MACT EEE compliance.
<b>Dow Response</b>	<b>Section 4.0 of the PETP has been revised to state that the stack gas flow meter performance will be demonstrated during the CPT using Performance Specification 6.</b>
CPTP	Considering history of the May 2005 CPT, Dow must demonstrate cyclonic flow conditions are within acceptable limits for the next CPT, particularly during low and high stack gas flow rates for Conditions 1 and 2 respectively. The CPT plan must be revised to adress this issue, and a DEQ Administrative Authority representative will be present to observe this test.
<b>Dow Response</b>	<b>Section 4.3 has been revised to state that a cyclonic flow check will be performed during the CPT.</b>

5650

BOBBY JINDAL  
GOVERNOR



HAROLD LEGGETT, Ph.D.  
SECRETARY

**State of Louisiana**  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
ENVIRONMENTAL SERVICES

November 5, 2008

**CERTIFIED MAIL 7003 2260 0001 2753 6406**  
**RETURN RECEIPT REQUESTED**

Ms. Lisa Perry  
EH & S Leveraged RCRA Specialist  
The Dow Chemical Company  
Post Office Box 150, Bldg. 3502  
Plaquemine, LA 70765-0150

**RE: The Dow Chemical Company – LAD 008 187 080, AI #1409**  
**Comprehensive Performance Test Plan – Solvents/EDC 1 Incinerator F-700**  
**Request for Additional Information**

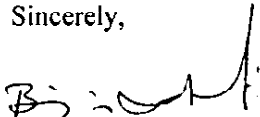
Dear Ms. Perry:

The Louisiana Department of Environmental Quality (LDEQ) has reviewed the Revision 1 Comprehensive Performance Test Plan (CPTP) for the Solvents/EDC 1 Incinerator F-700, dated August 1, 2008. LDEQ finds the plan to be deficient and offers comments as listed on the attached Request for Additional Information (RAI). Another revision of the CPTP must be submitted which addresses these issues.

This letter constitutes notification that the facility is required to submit three (3) paper and one (1) electronic copy on CD media of written responses to this request for additional information; and three (3) copies of the revised CPTP to LDEQ's Engineering Group 2 within sixty (60) days after receipt of this letter. A copy of the revised CPTP must also be submitted to EPA Region VI. Failure or refusal to comply with this notice within sixty (60) days may result in denial of the CPTP.

Thank you for your cooperation in this matter. If you have any comments, please contact Patrick Devillier at 225/219-3453 or Charles Handrich at (225) 219-3452.

Sincerely,

  
Bijan Sharafkhani, P.E.  
Administrator

pjd

Attachments

c: Kishor Fruitwala, Ph.D., P.E., EPA Region VI

**Received**

NOV 12 2008

**EH&S Department**  
**Dow Chemical**

**THE DOW CHEMICAL COMPANY**  
**LAD 008 187 080**  
**REQUEST FOR ADDITIONAL INFORMATION**

<u>Regulation</u>	<u>Comment</u>	Page 4 of 4
CPTP, Section 4.5	Considering history of the May 2005 CPT Condition 1 data, steady-state conditions for the CPT must include a variability limit for the C-720 absorber differential pressure to $\pm 50\%$ between high and low DP pressure readings over 5 minutes. The CPT plan must be revised to include this.	
CPTP, Section 6.3	Condition 1 feed rates in Table 6-1 (i.e. Hexes and Carbon Tetrachloride) must agree with feed rates in Table 4.3. Review of Condition 1 data from the 2005 CPT suggests that Table 4.3 is in error. The facility must correct whichever table is erroneous in the CPT plan.	
Performance Evaluation Test Plan	Considering history of the May 2005 CPT and subsequent modifications to the unit (new air blower, variable speed drive, flue gas recirculation line, and 2 gas flow meters in ports A and B respectively) Dow must demonstrate acceptable performance of stack gas flow meters over a range of flow gas rates according to EPA Performance Specification # 6 prior to performing the CPT. Previously submitted results (5/12/06 test event by B&T, higher flow rate condition) showed a greater than 20% difference between flow # 1 and the measured flow, and greater than 20% between Flow #1 and Flow #2. The PETP must be revised to include this procedure. Dow must demonstrate acceptable performance for both meters if they are to be used (primary and backup) for MACT/EEE compliance.	
CPTP	Considering history of the May 2005 CPT, Dow must demonstrate cyclonic flow conditions are within acceptable limits for the next CPT, particularly during low and high stack gas flow rates for Conditions 1 and 2 respectively. The CPT plan must be revised to address this issue, and a DEQ Administrative Authority representative will be present to observe this test.	

**THE DOW CHEMICAL COMPANY**  
**LAD 008 187 080**  
**REQUEST FOR ADDITIONAL INFORMATION**

<u>Regulation</u>	<u>Comment</u>	Page 2 of 4
40 CFR 63.1207(h)(2)	Maximum feed capacity is currently limited to 5000 lbs/hr per the August 28, 2007 letter (EDMS # 36227930). Dow is advised that operations at a higher feed capacity (Condition 2) would be allowed only during the 720 hours (renewable upon approval) after the CPT plan is approved and before the CPT is performed.	
40 CFR 63.1207	Dow must further explain in the CPT the basis for the waste feed matrix chosen for Condition 1. For the 9 month period from 1/1/04 to 9/30/04 Dow reportedly burned 9,744,104 lbs of "Hexes" waste, which represented approximately 70% of the total liquid waste fed to the TTU. "Hexes", which are solid at room temperature, would reasonably be difficult to inject and incinerate. However, this waste stream comprises only 18% of the Condition 1 waste feed matrix. Dow must propose a waste stream feed mixture that represents worst case conditions.	
40 CFR 63.1209(o)(3)(v)	For both the Absorber C-720 and the Scrubber C-730 Dow "must establish limits on either the minimum L/G ratio <u>or</u> the minimum scrubber water flow rate and maximum flue gas flow rate on an hourly rolling average (HRA) as the average of the test run averages". Per conditionally approved alternative monitoring application (AMA) requests # 2 and 3, the facility must demonstrate a minimum liquid flow rate L, HRA with automatic waste feed cut off (AWFCO), for Absorber C-720 and Scrubber C-730 as an alternative to both a liquid feed pressure limit and a minimum blowdown rate. The facility must also demonstrate a minimum L/G ratio for both units during Condition 2 (max feed rate and max flue gas flow rate). Minimum feed water rate L and L/G for both units will be established as the average of comprehensive performance test run averages of Condition 2.	

**THE DOW CHEMICAL COMPANY**  
**LAD 008 187 080**  
**REQUEST FOR ADDITIONAL INFORMATION**

<u>Regulation</u>	<u>Comment</u>	Page 3 of 4
40 CFR 63.1209(l)(v)	Dow's response to DEQ's May 20, 2008 comment is unacceptable. The mercury feed rate operating parameter limit may be extrapolated up to three times the highest historical feed rate, based on CPT demonstration results, but not up to maximum stack emission (permanent replacement) standards. The CPT plan must be revised accordingly. Documentation of historical feed rates must be included with Dow's extrapolation methodology.	
40 CFR 63.1209(n)(2)(vii)	Dow's response to DEQ's May 20, 2008 comment is unacceptable. The metals feed rate operating parameter limits may be extrapolated up to three times the highest historical feed rates, based on CPT demonstration results, but not up to maximum stack emission (permanent replacement) standards. The CPT plan must be revised accordingly. Documentation of historical feed rates must be included with Dow's extrapolation methodology.	
40 CFR 63.1209(g)(2)	Dow must propose an Operating Parameter Limit (OPL), with an automatic waste feed cut off, on the "cell effluent" (dilute caustic) flow to the chlorine scrubber, C-730, to ensure total chloride emissions do not exceed permanent replacement standards. The previous CPT (Condition 2) failed on total chloride emissions, and according to data from that test, the "cell effluent" (dilute caustic) flow dropped consistently across all three runs (8,073 lb/hr, 7,205 lb/hr, and 6,957 lb/hr avg flows respectively). Since target operating parameters, including pH, were maintained but chloride emissions still rose to unacceptable levels, Dow must establish during the next CPT an additional operating parameter limit on C-730, "cell effluent" flow, to ensure sufficient removal of chlorine at max chloride feed condition. The CPT plan must be revised to include this.	

## **Comprehensive Performance Test Plan**

**The Dow Chemical Company  
Solvents/EDC I Thermal Treatment Unit  
Louisiana Operations**

### **Prepared for:**

**The Dow Chemical Company  
P.O. Box 150  
Plaquemine, LA 70765**

### **Prepared by:**

**URS Corporation  
9400 Amberglen Boulevard (78729)  
P.O. Box 201088  
Austin, TX 78720-1088**

**January 2009**

## Table of Contents

	Page
<b>1.0 Introduction.....</b>	<b>1-1</b>
1.1 Test Objectives.....	1-2
1.2 Test Protocol Summary.....	1-3
1.2.1 Test Condition 1 – Minimum Temperature, Nominal Hazardous Waste, Metals, Chlorine, and Ash Feed Rates, and Combustion Gas Flow Rate .....	1-3
1.2.2 Test Condition 2 – Maximum Hazardous Waste, Metals, Chlorine, and Ash Feed Rates, and Maximum Combustion Gas Flow Rate .....	1-3
<b>2.0 Waste Characterization.....</b>	<b>2-1</b>
2.1 Feed Stream Descriptions .....	2-1
2.1.1 Liquid Waste Feeds.....	2-1
2.1.2 Fuels.....	2-1
2.1.3 Other Feed Streams.....	2-1
2.1.4 Process Vent Feed Streams.....	2-2
2.2 Hazardous Air Pollutants .....	2-3
<b>3.0 Engineering Description.....</b>	<b>3-1</b>
3.1 Combustion Chamber .....	3-1
3.2 Feed Systems .....	3-3
3.2.1 Waste Forms .....	3-3
3.2.2 Waste Feeding and Supplemental Fuel.....	3-4
3.2.3 Controls of Feedstreams .....	3-5
3.2.4 Automatic Waste Feed Cutoff (AWFCO) System.....	3-5
3.3 Air Pollution Control Equipment.....	3-6
3.3.1 Quench System .....	3-6
3.3.2 Packed Bed HCl Absorber.....	3-6
3.3.3 Packed Bed Chlorine Scrubber .....	3-7
3.3.4 Induced Draft Blower .....	3-7
3.3.5 Stack.....	3-7
<b>4.0 Test Design and Protocol.....</b>	<b>4-1</b>
4.1 Regulatory Requirements.....	4-1
4.2 Establishing Operating Condition Limits .....	4-2
4.3 Test Plan and Approach .....	4-2
4.3.1 Test Condition 1 - Minimum Temperature, Nominal Hazardous Waste, Metals, Chlorine, and Ash Feed Rates, and Combustion Gas Flow Rate .....	4-2
4.3.2 Test Condition 2 - Maximum Hazardous Waste, Metals, Chlorine, and Ash Feed Rates, and Maximum Combustion Gas Flow Rate .....	4-3

## Table of Contents (continued)

	Page
4.4 Waste Feed Streams.....	4-3
4.4.1 Waste Feed Stream Selection.....	4-3
4.4.2 Expected Constituent Levels in Natural Gas, Process Air & Other Feed Streams.....	4-4
4.4.3 POHC Selection Rationale.....	4-5
4.4.4 Waste Feed Spiking.....	4-5
4.4.4.1 POHC Spiking.....	4-6
4.4.4.2 Ash Spiking.....	4-7
4.4.4.3 Metals Spiking.....	4-8
4.5 System Operation to Achieve Steady-state Conditions.....	4-8
4.6 Determination of Hazardous Waste Residence Time.....	4-9
4.7 Extrapolation of Metals Feed Rate Limits.....	4-9
4.8 AWFCO System During the CPT.....	4-10
4.9 Continuous Monitoring System Performance Evaluation.....	4-10
4.10 Request for Approval to Use EPA Method 23 for PCDD/PCDFs.....	4-10
 <b>5.0 Sampling, Analysis, and Monitoring Procedures.....</b>	 <b>5-1</b>
5.1 Sampling Locations and Procedures.....	5-2
5.1.1 Liquid Sampling Procedures.....	5-4
5.1.2 Process Vent Sampling Procedure.....	5-4
5.1.3 Stack Gas Sampling Procedures.....	5-4
5.1.3.1 Sample Port Location.....	5-4
5.1.3.2 EPA Methods 2, 3, and 4 (Flow Rate, Gas Composition, and Moisture).....	5-5
5.1.3.3 EPA Method 5 (PM).....	5-5
5.1.3.4 EPA Method 26A (HCl and Cl <sub>2</sub> ).....	5-5
5.1.3.5 EPA Method 23 (Dioxins/Furans).....	5-5
5.1.3.6 SW-846 Method 0030 (Volatile Organic POHC).....	5-6
5.1.3.7 EPA Method 29 (Metals).....	5-6
5.1.3.8 Continuous Emissions Monitoring (CO, O <sub>2</sub> , and THC).....	5-7
5.2 Analysis Procedures.....	5-7
5.2.1 Composition and Physical Parameters.....	5-7
5.2.2 Stack Gas Samples for Particulate Matter Analysis.....	5-8
5.2.3 Stack Gas Samples for HCl and Cl <sub>2</sub> Analysis.....	5-8
5.2.4 Stack Gas Samples for Dioxins and Furans Analysis.....	5-8
5.2.5 Stack Gas for Volatile POHC Analysis.....	5-9
5.2.6 Stack Gas and Waste Feed Samples for Metals Analyses.....	5-9
5.2.7 Process Vent Gas Samples for Organic Chlorine Analysis.....	5-9
5.3 Process Monitoring Procedures.....	5-9
5.4 Quality Assurance/Quality Control Procedures.....	5-10
5.4.1 Sampling QA/QC.....	5-11
5.4.2 Procedures for Analytical Quality Control.....	5-13

## Table of Contents (continued)

	Page
<b>6.0 Test Schedule.....</b>	<b>6-1</b>
6.1 Planned Test Dates.....	6-1
6.2 Duration of Each Test .....	6-1
6.3 Quantity of Waste to be Burned.....	6-1
6.4 Detailed Schedule of Planned Test Activities.....	6-2

Appendix A – Continuous Monitoring System Performance Evaluation Test Plan

Appendix B – Quality Assurance Project Plan

## List of Figures

		Page
3-1	Process Flow Diagram .....	3-2

## List of Tables

		Page
2-1	Waste Stream Characteristics – Solvent Heavies .....	2-4
2-2	Waste Stream Characteristics – EDC Heavies.....	2-5
2-3	Waste Stream Characteristics – Hexes .....	2-6
2-4	Waste Stream Characteristics – Chlorine Taffy.....	2-7
2-5	Waste Stream Characteristics –General Waste.....	2-8
2-6	Waste Stream Characteristics – VRU Waste.....	2-9
2-7	Waste Stream Characteristics – Glycol Ethers/PDC .....	2-10
2-8	Waste Stream Characteristics – Process Vents.....	2-11
3-1	F-700 Major Process Instrumentation.....	3-8
4-1	40 CFR 63 Subpart EEE Emissions Standards and Operating Parameter Limits.....	4-11
4-2	Applicable Test Objectives for the Comprehensive Performance Tests .....	4-12
4-3	Test Condition 1 – Feed Rates and Operating Conditions.....	4-13
4-4	Test Condition 2 – Feed Rates and Operating Conditions.....	4-14
4-5	Stack Metal Detection Limits, Emission Rates and System Removal Efficiencies – Test Condition 1.....	4-15
4-6	Stack Metal Detection Limits, Emission Rates and System Removal Efficiencies – Test Condition 2.....	4-15
5-1	Sample Frequency.....	5-2
5-2	Sampling Matrix – Test Conditions 1 & 2.....	5-3
5-3	Summary of Analytical Methods.....	5-7
5-4	Summary of Matrix-specific QC Sample Requirements .....	5-12
6-1	Material Quantities.....	6-1

## 1.0 Introduction

The Dow Chemical Company (Dow) operates a chemical manufacturing facility in Plaquemine, Louisiana. The Solvents/EDC I TTU, F-700, treats RCRA hazardous waste under Permit LAD008187080. The Solvents/EDC I TTU is currently operated in compliance with the Interim Standards of the National Emission Standards for Hazardous Air Pollutants (NESHAPS) from Hazardous Waste Combustors [Title 40 of the Code of Federal Regulations, Part 63 (40 CFR Part 63), Subpart EEE], commonly referred to as the HWC MACT. On October 12, 2005, the EPA promulgated the permanent replacement standards for incinerators and the Solvents incinerator is subject to these standards.

The Solvents/EDC I TTU conducted a comprehensive performance test from April 26<sup>th</sup> through May 4<sup>th</sup>, 2005 to demonstrate compliance with the interim standards of the HWC MACT. While the Solvents/EDC I TTU showed compliance with the standards, the limit for one of the operating parameters (maximum stack gas flow rate) was not set in accordance with the rules. The Solvents/EDC I TTU had originally submitted an alternative monitoring request to use a surrogate for maximum stack gas flow rate as the F-700 did not have a continuous stack gas flow monitor installed on the stack; however, Dow was not successful in demonstrating an acceptable correlation between the surrogate and stack gas flow. Therefore, Dow had to use stack gas flow rate as the operating parameter, and the limit for stack gas flow rate was set as the average of the stack gas flow rates for each run as measured during the stack testing, and not as the average of the maximum hourly rolling averages for each run as measured by a continuous stack gas flow rate monitor [per 40 CFR 63.1209(j)(2), (k)(3), (m)(2), (n)(5), and (o)((2))]. This issue has caused the EPA and LDEQ to require a re-demonstration of the interim standards of the HWC MACT and the correct establishment of the Operating Parameter Limit (OPL) for maximum stack gas flow rate.

The Solvents/EDC I Thermal Treatment Unit (TTU) treats both liquid and vapor wastes. Aside from burning hazardous wastes, the TTU intermittently acts as the control device for production plant vent streams that are subject to the Hazardous Organic NESHAPS (HON) 40 CFR 63 Subpart G. Dow will comply with all applicable HON requirements when the TTU is burning HON vents and hazardous waste is no longer in the combustion chamber.

Because the permanent replacement standards compliance date is October 14, 2008, Dow wishes to conduct the initial Comprehensive Performance Test (CPT) to demonstrate compliance with the permanent replacement standards in conjunction with the re-demonstration

of the interim standards. This document is a Comprehensive Performance Test Plan (CPTP) that presents Dow's plan for testing at the Solvents/EDC I TTU, F-700, at the Plaquemine facility to demonstrate compliance with both the interim standards and the permanent replacement standards of the HWC MACT.

## 1.1 Test Objectives

Under the Clean Air Act (CAA), this CPT Plan is designed to meet the objectives promulgated in 40 CFR 63 Subpart EEE, NESHAPs for HWCs for existing incinerators at §63.1203(a) and §63.1219(a). The test objectives are outlined as follows:

- Demonstrate compliance with the stack gas emissions less than or equal to the §63.1203(a) Interim Standards limits. Emission limits are corrected for moisture and corrected to 7% O<sub>2</sub>:
  - Carbon monoxide: 100 ppmv, dry basis;
  - Total hydrocarbons; 10 ppmv, dry basis, during the DRE test runs;
  - Dioxins and furans: 0.40 ng TEQ/dscm,
  - Particulate matter (PM): 34 mg/dscm (0.015 grains/dscf);
  - DRE (99.99%) of the selected POHC (monochlorobenzene);
  - Mercury: 130 µg/dscm;
  - Semivolatile metals (SVM) (Cd and Pb combined): 240 µg/dscm;
  - Low volatile metals (LVM) (As, Be and Cr combined): 97 µg/dscm; and
  - HCl / Cl<sub>2</sub>: 77 ppmv combined, dry basis;
- Demonstrate compliance with stack gas emissions less than or equal to the §63.1219(a) Permanent Replacement Standards limits. Emission limits are corrected for moisture and corrected to 7% O<sub>2</sub>:
  - Carbon monoxide: 100 ppmv, dry basis;
  - Total hydrocarbons; 10 ppmv, dry basis, during the DRE test runs;
  - Dioxins and furans: 0.40 ng TEQ/dscm,
  - Particulate matter (PM): 0.013 grains/dscf;
  - DRE (99.99%) of the selected POHC (monochlorobenzene);
  - Mercury: 130 µg/dscm;
  - Semivolatile metals (SVM) (Cd and Pb combined): 230 µg/dscm;
  - Low volatile metals (LVM) (As, Be and Cr combined): 92 µg/dscm; and
  - HCl / Cl<sub>2</sub>: 32 ppmv as Cl equivalent, dry basis;
- Establish limits for operating parameters. One set of operating parameter limits will be established which show compliance with the most stringent standards.
- Demonstrate the performance of the continuous monitoring system.

## **1.2 Test Protocol Summary**

The test objectives will be accomplished while conducting two test conditions, each to be performed with triplicate runs. Complete definition of test objectives is described in Section 4. A brief description of the test condition is provided below.

### **1.2.1 Test Condition 1 – Minimum Temperature, Nominal Hazardous Waste, Metals, Chlorine, and Ash Feed Rates, and Combustion Gas Flow Rate**

Test Condition 1 is designed to demonstrate Destruction Removal Efficiency (DRE), carbon monoxide, total hydrocarbons, PM, SVM, LVM, mercury, HCl/Cl<sub>2</sub>, and dioxins and furans standards while the plant is operating under an acceptable, but more restrictive set of operating conditions. The purpose of Test Condition 1 is to establish the minimum combustion chamber temperature simultaneously with an acceptable total hazardous waste feed rate and an elevated combustion gas flow rate in the event that the unit fails to meet the standards under the maximum rates and conditions of Test Condition 2. The acceptable feed rates of metals, chlorine and ash will also be demonstrated at this nominal-rate test condition. The process vent will be fed for organic chlorine during this condition.

### **1.2.2 Test Condition 2 – Maximum Hazardous Waste, Metals, Chlorine, and Ash Feed Rates, and Maximum Combustion Gas Flow Rate**

Test Condition 2 is designed to demonstrate DRE, carbon monoxide, total hydrocarbons, PM, SVM, LVM, mercury, HCl/Cl<sub>2</sub>, and dioxins and furans standards while the plant is operating to establish a maximum total hazardous waste feed rate and maximum combustion gas flow rate. Maximum feed rates of metals, chlorine and ash will also be demonstrated.

## **2.0 Waste Characterization**

The Dow Plaquemine TTU, F-700, treats liquid hazardous waste and gaseous process vents. Physical and chemical characteristics of the hazardous waste streams are included in this section.

### **2.1 Feed Stream Descriptions**

Hazardous waste streams incinerated in F-700 are generated on-site. Dow does not receive offsite wastes. The Solvents TTU operates under both RCRA and TSCA permits. The waste streams regulated by TSCA are also regulated by RCRA, but all of the RCRA streams are not regulated by TSCA. The waste streams treated in F-700 can be categorized into four types:

- RCRA hazardous wastes that are also TSCA wastes (i.e. contain PCBs >50 ppm);
- RCRA hazardous wastes that are not TSCA wastes;
- Process vents from the Solvents Plant and other onsite sources; and
- Non-RCRA / Non-Hazardous wastes.

#### **2.1.1 Liquid Waste Feeds**

Typically, the liquid wastes are fed continuously to the TTU. They may be fed directly from a source process, from containers, or may be stored in tanks before being sent to the TTU. The Chlorinated Solvents production process generates chlorinated and non-chlorinated hydrocarbons. Tables 2-1 through 2-7 provide physical and chemical characteristics of the liquid hazardous waste streams currently burned in the Solvents TTU. The information provided is from recent analyses.

#### **2.1.2 Fuels**

Natural gas is burned in the TTU to maintain temperature and during start-up and shutdown conditions.

#### **2.1.3 Other Feed Streams**

Other wastes treated are authorized by the TSCA permit and include laboratory samples and collected spill material, PCB mineral oil dielectric fluid from on-site transformers, and PCB contaminated rinse waste from decontamination and maintenance activities. Laboratory samples are collected twice per year for the Hexes waste stream and the EDC Heavies waste stream. The frequency of treatment of waste streams resulting from the disposal of PCB mineral oil dielectric

fluid from on-site transformers, spills and maintenance activities cannot be predicted but are very infrequent. It has been a number of years since PCB mineral oil was disposed. Dow will have this fluid characterized whenever disposal at the Solvents TTU is necessary.

When performing maintenance on equipment containing these TSCA streams, the TSCA regulations requires triple rinsing of the equipment; therefore, the composition of these streams will be very similar to either the EDC Heavies waste stream or the Hexes waste stream with significantly more dichloroethane (EDC) or perchloroethylene (PERC) respectively. Dow will abide by all TSCA, RCRA and air regulations for clean-up and disposal of spilled and waste streams generated as a result of maintenance.

#### **2.1.4 Process Vent Feed Streams**

The process vent streams originate from the Solvents Plant and other onsite sources. The composition of these vents as they enter the TTU is primarily nitrogen, hydrogen chloride, chlorine, and organics. Table 2-8 lists the vent streams, the mass fed to the TTU between January 1, 2004 and September 30, 2004, and their chemical compositions.

Chlorine loading from the vents is calculated based on vent composition data and vent flow rates that are monitored and recorded at one-minute intervals. The chlorine calculation is performed by multiplying the chlorine value associated with each compound in the vent by the flow rate of the vent to get a pounds per minute value for that particular compound. All of the compounds containing chlorine are then summed to get a pounds per minute of chlorine from that vent.

The vent streams (excluding the nitrogen component) typically account for only a small part of the total organic mass of waste feed, so the BTU content of these vents, although minimal, can slightly increase the heat load in the burner without adding to the hazardous waste feed rate. Dow will be feeding process vent streams during Test Condition 1 only. During Test Condition 2, as the goal will be to maximize waste and chlorine waste feed, all heat input to the TTU will be from liquid hazardous waste feeds.

## 2.2 Hazardous Air Pollutants

Under the HWC MACT, the CPT must identify organic hazardous air pollutants (HAPs) that are in the waste streams. To support the identification of these compounds, Dow sampled and analyzed each waste stream for semivolatile organics using analytical method SW-846 8270, Volatile Organics using analytical method SW-846 8260, and metals. Tables 2-1 through 2-7 identify the HAPs that were detected. Many HAPs are not included on the method 8270 or 8260 lists. These HAPs would not be expected to be present in the waste streams. The basis for not expecting the presence of these compounds is Dow's experience with these materials.

**Table 2-1. Waste Stream Characteristics – Solvent Heavies<sup>1</sup>**

Regulated Constituent Common Name	CAS Number	Min	Max	Average
<b>Volatiles (mg/kg)</b>				
Acetone	67-64-1	4,200	6,600	5,400
Bromomethane	74-83-9	500	500	500
2-Butanone	78-93-3	820	820	820
Carbon tetrachloride	56-23-5	210,000	350,000	300,000
Chloroethane	75-00-3	880	880	880
Chloroform	67-66-3	850	1,600	1,225
1,1-Dichloroethane	75-34-3	650	650	650
1,2-Dichloroethane	107-06-2	2,400	8,300	4,400
cis-1,2-Dichloroethene	156-59-2	160	160	160
1,2-Dichloropropane	78-87-5	88,000	140,000	107,667
Hexachlorobutadiene	87-68-3	1,600	3,000	2,133
Methylene chloride	75-09-2	600	9,700	5,300
Naphthalene	91-20-3	160	160	160
1,1,1,2-Tetrachloroethane	630-20-6	10,000	28,000	17,667
1,1,2,2-Tetrachloroethane	79-34-5	70,000	110,000	88,333
Tetrachloroethene	127-18-4	230,000	460,000	313,333
1,1,1-Trichloroethane	71-55-6	180	180	180
1,1,2-Trichloroethane	79-00-5	9,800	16,000	12,933
Trichloroethene	79-01-6	7,200	8,700	8,000
<b>Semivolatiles (mg/kg)</b>				
Hexachlorobenzene	118-74-1	180	310	230
Hexachlorobutadiene	87-68-3	1,200	2,200	1,667
Hexachloroethane	67-72-1	12,000	20,000	17,000
<b>Metals Analysis (mg/kg)</b>				
Arsenic (As)	7440-38-2	ND(0.59)	ND(0.59)	ND(0.59)
Beryllium (Be)	7440-41-7	ND(0.02)	ND(0.02)	ND(0.02)
Cadmium (Cd)	7440-43-9	ND(0.08)	ND(0.08)	ND(0.08)
Chromium (Cr)	7440-47-3	ND(0.4)	ND(0.4)	ND(0.4)
Lead (Pb)	7439-92-1	0.12	0.22	0.173
Mercury (Hg)	7439-97-6	0.017	0.021	0.019
<b>Physical Properties Analysis</b>				
Chlorine	%	52.0%	94.7%	71.9%
Density	g/mL	1.5	1.5	1.5
Heat of Combustion	Btu/lb	395	3,260	1,928
Ash	%	0.01%	0.08%	0.04%
Viscosity (at 25°C)	cSt	0.6859	0.7180	0.7017

<sup>1</sup> The solvent Heavies stream is a pumpable liquid from the chlorinated solvents process. There were 286,366 lbs of this waste fed to the TTU between January 1, 2004 and September 30, 2004.

**Table 2-2. Waste Stream Characteristics – EDC Heavies<sup>1</sup>**

Regulated Constituent Common Name	CAS Number	Min	Max	Average
<b>Volatiles (mg/kg)</b>				
Acetone	67-64-1	5,400	14,000	9,700
Bromomethane	74-83-9	590	590	590
2-Butanone	78-93-3	920	920	920
Chloroethane	75-00-3	32,000	45,000	36,333
Chloroform	67-66-3	1,200	1,400	1,300
1,1-Dichloroethane	75-34-3	250	420,000	210,125
1,2-Dichloroethane	107-06-2	340,000	390,000	365,000
Hexachlorobutadiene	87-68-3	1,800	8,200	5,000
Methylene chloride	75-09-2	710	18,000	8,770
1,1,2,2-Tetrachloroethane	79-34-5	91,000	110,000	100,333
Tetrachloroethene	127-18-4	790	1,400	1,095
1,1,2-Trichloroethane	79-00-5	260,000	330,000	303,333
Trichloroethene	79-01-6	960	2,800	1,880
<b>Semivolatiles (mg/kg)</b>				
Hexachlorobenzene	118-74-1	290	610	497
Hexachlorobutadiene	87-68-3	1,100	2,200	1,800
Hexachloroethane	67-72-1	120	280	223
Pentachlorophenol	87-86-5	1,200	1,400	1,300
<b>Metals Analysis (mg/kg)</b>				
Arsenic (As)	7440-38-2	ND(0.59)	ND(0.59)	ND(0.59)
Beryllium (Be)	7440-41-7	ND(0.02)	ND(0.02)	ND(0.02)
Cadmium (Cd)	7440-43-9	ND(0.08)	ND(0.08)	ND(0.08)
Chromium (Cr)	7440-47-3	0.820	0.890	0.857
Lead (Pb)	7439-92-1	0.190	0.450	0.290
Mercury (Hg)	7439-97-6	ND(0.005)	ND(0.005)	ND(0.005)
<b>Physical Properties Analysis</b>				
Chlorine	%	35.6%	65.5%	46.9%
Density	g/mL	1.40	1.40	1.40
Heat of Combustion	Btu/lb	2,370	4,220	3,447
Ash	%	0.12%	0.23%	0.16%
Viscosity (at 25°C)	cSt	0.98	1.06	1.02

<sup>1</sup> Regulated as a TSCA/RCRA stream. The EDC Heavies stream is a pumpable liquid from the EDC process that are accumulated and incinerated as process conditions. There was not any of this waste fed to the TTU between January 1, 2004 and September 30, 2004.

**Table 2-3. Waste Stream Characteristics – Hexes<sup>1</sup>**

Regulated Constituent Common Name	CAS Number	Min	Max	Average
<b>Volatiles (mg/kg)</b>				
Acetone	67-64-1	5,700	5,700	5,700
Carbon tetrachloride	56-23-5	5,900	27,000	14,967
Hexachlorobutadiene	87-68-3	74,000	94,000	82,333
Methylene chloride	75-09-2	620	1,800	1,210
Naphthalene	91-20-3	1,100	1,100	1,100
Tetrachloroethene	127-18-4	17,000	46,000	30,000
<b>Semivolatiles (mg/kg)</b>				
Hexachlorocyclopentadiene	77-47-4	1,300	1,300	1,300
Hexachlorobenzene	118-74-1	80,000	120,000	95,333
Hexachlorobutadiene	87-68-3	44,000	78,000	57,000
Hexachloroethane	67-72-1	34,000	96,000	57,667
<b>Metals Analysis (mg/kg)</b>				
Arsenic (As)	7440-38-2	ND(0.59)	ND(0.59)	ND(0.59)
Beryllium (Be)	7440-41-7	ND(0.02)	ND(0.02)	ND(0.02)
Cadmium (Cd)	7440-43-9	ND(0.08)	ND(0.08)	ND(0.08)
Chromium (Cr)	7440-47-3	1.20	1.6	1.47
Lead (Pb)	7439-92-1	0.17	0.32	0.24
Mercury (Hg)	7439-97-6	ND(0.005)	ND(0.005)	ND(0.005)
<b>Physical Properties Analysis</b>				
Chlorine	%	13.3%	24.7%	18.5%
Density	lbs/cu ft	31.10	52.30	44.60
Heat of Combustion	Btu/lb	1,510	2,950	2,180
Ash	%	0.01%	0.04%	0.02%
Viscosity (at 180°C)	cPs	0.408	0.408	0.408

<sup>1</sup> The Hexes waste stream is a solid material at room temperature that is heated to render it a pumpable liquid from the Per/Test process. There is a high-molecular weight organic constituency (tar) that is not measured as a volatile or semivolatile organic, or as ash. Consequently, the reported constituents do not complete a mass balance for this material. There was 9,744,104 lbs of this waste fed to the TTU between January 1, 2004 and September 30, 2004.

**Table 2-4. Waste Stream Characteristics – Chlorine Taffy<sup>1</sup>**

Regulated Constituent Common Name	CAS Number	Min	Max	Average
<b>Volatiles (%)</b>				
Carbon tetrachloride	56-23-5	59.8	59.8	59.8
Chlorine	7782-50-5	36.8	36.8	36.8
Chloroform	67-66-3	3.45	3.45	3.45
<b>Semivolatiles (mg/kg)</b>				
Hexachlorobenzene	118-74-1	0.000012	0.000012	0.000012
Hexachloroethane	67-72-1	0.00026	0.00026	0.00026
<b>Metals Analysis (mg/kg)</b>				
Arsenic (As)	7440-38-2	0.017	0.022	0.020
Beryllium (Be)	7440-41-7	0.001	0.001	0.001
Cadmium (Cd)	7440-43-9	0.002	0.002	0.002
Chromium (Cr)	7440-47-3	0.042	0.226	0.099
Lead (Pb)	7439-92-1	0.015	1.116	0.318
Mercury (Hg)	7439-97-6	0.024	0.744	0.341
<b>Physical Properties Analysis</b>				
Chlorine	%	95	95	95
Density	g/mL	1.1	1.1	1.1
Heat of Combustion	Btu/lb	161	161	161
Ash	%	0.01	0.01	0.01
Viscosity (at 25°C)	cSt	2.03	2.03	2.03

<sup>1</sup> The chlorine taffy stream is a pumpable liquid from the chlorine purification process diluted with carbon tetrachloride. There was 1,720,380 lbs of this waste fed to the TTU between January 1, 2004 and September 30, 2004.

**Table 2-5. Waste Stream Characteristics – General Waste<sup>1</sup>**

Regulated Constituent Common Name	CAS Number	Min	Max	Average
<b>Volatiles (mg/kg)</b>				
Acetone	67-64-1	7,200	20,000	13,600
Bromochloromethane	74-97-5	460	460	460
Carbon tetrachloride	56-23-5	8,100	290,000	121,033
Chloroform	67-66-3	200,000	260,000	230,000
1,2-Dichloroethane	107-06-2	330,000	490,000	410,000
1,2-Dichloropropane	78-87-5	1,300	3,900	2,600
Hexachlorobutadiene	87-68-3	480	480	480
Methylene chloride	75-09-2	10,000	140,000	72,000
4-Methyl-2-pentanone	108-10-1	0	0	0
Naphthalene	91-20-3	0	0	0
n-Propylbenzene	103-65-1	0	0	0
Styrene	100-42-5	0	0	0
1,1,1,2-Tetrachloroethane	630-20-6	0	0	0
1,1,2,2-Tetrachloroethane	79-34-5	560	560	560
Tetrachloroethene	127-18-4	41,000	480,000	330,333
1,1,2-Trichloroethane	79-00-5	790	790	790
<b>Metals Analysis (mg/kg)</b>				
Arsenic (As)	7440-38-2	0.60	0.60	0.60
Beryllium (Be)	7440-41-7	0.14	0.14	0.14
Cadmium (Cd)	7440-43-9	ND(0.08)	ND(0.08)	ND(0.08)
Chromium (Cr)	7440-47-3	0.45	5.00	2.73
Lead (Pb)	7439-92-1	0.17	0.23	0.20
Mercury (Hg)	7439-97-6	0.01	0.01	0.01
<b>Physical Properties Analysis</b>				
Chlorine	%	19.1	65.2	39.2
Density	g/mL	1.4	1.6	1.5
Heat of Combustion	Btu/lb	822	3,240	2,247
Ash	%	0.01	0.34	0.12
Viscosity (at 25°C)	cSt	0.4932	0.5278	0.5058

<sup>1</sup> The general waste stream is a pumpable liquid from containers that includes sample waste from process labs and general plant maintenance waste. There was 63,769 lbs of this waste fed to the TTU between January 1, 2004 and September 30, 2004.

Table 2-6. Waste Stream Characteristics – VRU Waste<sup>1</sup>

Regulated Constituent Common Name	CAS Number	Min	Max	Average
<b>Volatiles (mg/kg)</b>				
Acetone	67-64-1	5,800	7,800	6,800
Bromochloromethane	74-97-5	880	880	880
Carbon tetrachloride	56-23-5	6,200	27,000	13,967
Chloroform	67-66-3	200,000	570,000	353,333
1,2-Dichloroethane	107-06-2	370,000	950,000	620,000
1,2-Dichloropropane	78-87-5	530	530	530
Hexachlorobutadiene	87-68-3	5,800	5,800	5,800
Methylene chloride	75-09-2	97,000	170,000	129,000
1,1,2,2-Tetrachloroethane	79-34-5	2,600	2,600	2,600
Tetrachloroethene	127-18-4	35,000	140,000	74,333
1,1,2-Trichloroethane	79-00-5	1,900	1,900	1,900
<b>Metals Analysis (mg/kg)</b>				
Arsenic (As)	7440-38-2	ND(0.59)	ND(0.59)	ND(0.59)
Beryllium (Be)	7440-41-7	ND(0.02)	ND(0.02)	ND(0.02)
Cadmium (Cd)	7440-43-9	ND(0.08)	ND(0.08)	ND(0.08)
Chromium (Cr)	7440-47-3	ND(0.4)	ND(0.4)	ND(0.4)
Lead (Pb)	7439-92-1	0.12	0.19	0.16
Mercury (Hg)	7439-97-6	ND(0.005)	ND(0.005)	ND(0.005)
<b>Physical Properties Analysis</b>				
Chlorine	%	21.2%	67.5%	51.5%
Density	g/mL	1.3	1.4	1.4
Heat of Combustion	Btu/lb	1,030	5,410	3,483
Ash	%	0.01%	0.01%	0.01%
Viscosity (at 25°C)	cSt	0.5	0.5100	0.5033

<sup>1</sup>The VRU waste stream is a pumpable liquid from the pressure swing adsorption unit. There was 870,664 lbs of this waste fed to the TTU between January 1, 2004 and September 30, 2004.

Table 2-7. Waste Stream Characteristics – Glycol Ethers/PDC

Regulated Constituent Common Name	CAS Number	Min	Max	Average
<b>Volatiles (mg/kg)</b>				
Acetone	67-64-1	32,000	66,700	46,233
1,2-Dichloropropane	78-87-5	110,000	664,100	368,033
1,2,3-Trichloropropane	96-18-4	27,000	68,600	43,867
Methylene chloride	75-09-2	0	4,800	2,000
Tetrachloroethene	127-18-4	0	1,500	500
2-Butanone	78-93-3	0	9,200	3,067
Chloroform	67-66-3	0	680	227
Naphthalene	91-20-3	0	540	180
Toluene		0	1,700	567
<b>Semivolatiles (mg/kg)</b>				
2,2'-Oxybis(1-chloropropane)	108-60-1	120,000	200,700	150,233
2-methyl phenol		0	440	147
<b>Metals Analysis (mg/kg)</b>				
Arsenic (As)	7440-38-2	ND	0.049	0.016
Beryllium (Be)	7440-41-7	ND(.019)	ND(.019)	ND(.019)
Cadmium (Cd)	7440-43-9	ND(.013)	ND(.013)	ND(.013)
Chromium (Cr)	7440-47-3	ND	0.198	0.067
Lead (Pb)	7439-92-1	ND(.031)	ND(.031)	ND(.031)
Mercury (Hg)	7439-97-6	ND(.005)	ND(.005)	ND(.005)
<b>Physical Properties Analysis</b>				
Chlorine	mg/kg	390,000	444,200	425,067
Density	g/mL	1.09	1.10	1.10
Heat of Combustion	Btu/lb	9,400	9,736	9,582
Ash	mg/kg	ND(.01)	ND(.01)	ND(.01)
Viscosity (at 25°C)	cSt	0.760	1.22	0.955

<sup>1</sup> The Glycol Ethers/PDC waste stream is a pumpable liquid from the production of 1,2-dichloropropane. There was 1,219,966 lbs of this waste fed to the TTU between January 1, 2004 and September 30, 2004.

Table 2-8. Waste Stream Characteristics – Process Vents

Characteristic	C-510/SB Wet Vents (D-702)	P/T Dry Vents (D-700)	R&D Vents	D-42B Vent (D-42)	Glycol I Vents (K-102)
Quantity Fed YTD (lbs) <sup>1</sup>	373,776	2,604,876	109,000	321,967	33,724
<b>Chemical Composition (%)</b>					
Nitrogen	0.14	91.5		98.1	28.59
Hydrogen chloride	86.2		36.16		
Chlorine	13.6				9.1
Methanol				0.1	
Ethane					1.31
Chloroform				0.3	6.3
Carbon Tetrachloride	0.06	6.0			1.2
1,2-Dichloroethane				0.1	
1,2-Dichloropropane		0.5	56.06	0.2	3.9
1,3 Dichloropropane			7.78		
Tetrachloroethene		2.0		1.2	
Methylene chloride					24.8
Propylene oxide					24.8

<sup>1</sup> During operating period from January 1, 2004 through September 30, 2004.

### 3.0 Engineering Description

This section provides a detailed engineering description of the Solvents/EDC I Thermal Treatment Unit (TTU) F-700. A complete system flow diagram is provided in Figure 3-1. The Solvents/EDC Thermal Treatment Unit includes the following components:

- Combustion chamber;
- Quench drum;
- Hydrogen chloride (HCl) absorber;
- Chlorine scrubber;
- Induced draft and forced draft blower; and
- Stack.

The unit is required by RCRA to achieve 99.99% DRE for hazardous organics in the feed. The emission control system includes the quench drum, absorber, scrubber, induced and forced draft blowers, and stack.

#### 3.1 Combustion Chamber

The Solvents/EDC I Thermal Treatment Unit consists of a horizontally fired combustion chamber designed by Dow and manufactured by Best Manufacturing. The unit has a design capacity of 27 million Btu/hr. The Solvents combustor was originally built in 1977. The combustor utilizes a High Vortex Burner for mixing and a combustion chamber designed to provide between one and two seconds of residence time. In 2005 a Comprehensive Performance Test defined the operating ranges, limits and efficiency of 99.9999%. The CPT test results are on file and available for review as requested.

The shell of the combustion chamber is manufactured of carbon steel and is lined with refractory material. Destruction of organics takes place in the 18-ft long, 6-ft diameter combustion chamber and in the 46-ft long, 3-ft diameter overhead line from the combustion chamber to the quench tank. The temperature through the unit and overhead line exceeds 1,080°C when burning hazardous waste.

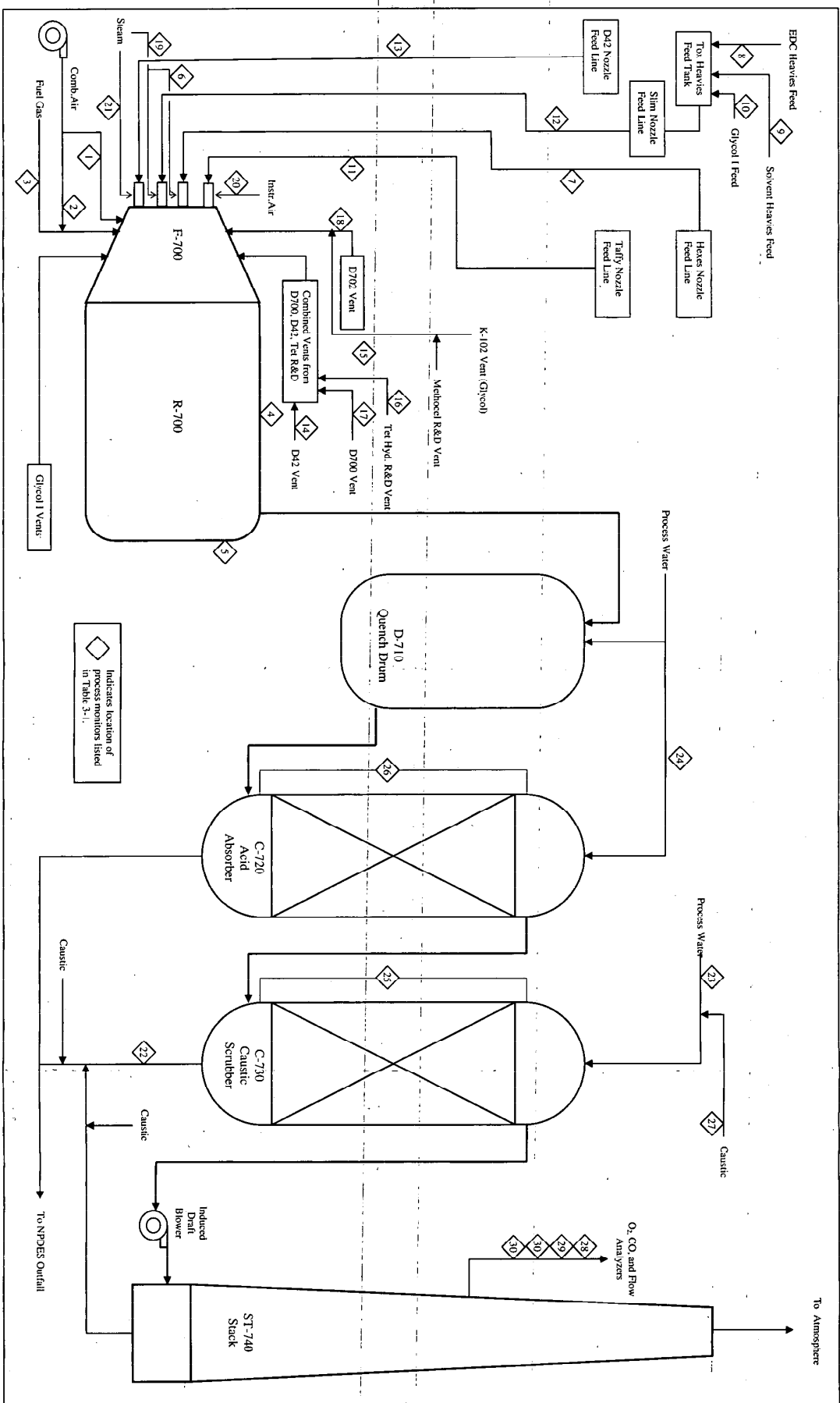


Figure 3-1. F-700 Process Flow Diagram

The total volume of the combustion zone is 795 ft<sup>3</sup>. The residence time varies as a function of temperature, heat input, and gas flow. The combustion chamber normally operates in a temperature range of 1,110°C to 1,400°C when burning hazardous waste. Temperature is monitored by two thermocouples located on the side and back of the incinerator. The lower temperature reading from these two thermocouples is used for compliance. Combustion gas flows from the combustion chamber, through the overhead line, and to the quench drum.

### **3.2 Feed Systems**

The Solvents/EDC I Thermal Treatment Unit (TTU) was designed and constructed to provide an economical and efficient method for treatment of a number of liquid waste streams. Management of wastes fed to the unit and controls on how wastes are fed are critical to performance.

Feed locations for waste streams and auxiliary fuels to the unit include:

- Four liquid waste feed nozzles;
- One auxiliary fuel burner for fuel gas; and
- Three vent gas nozzles.

One auxiliary fuel burner is equipped with fuel gas firing capability for temperature control, if required. The flow rate of vent streams is continuously monitored by flow meters (see Table 3-1).

Section 3.2.1 discusses waste handling. The physical means of feeding wastes to the unit is discussed in Section 3.2.2. Ways in which Dow measures the feed rates of different waste streams is discussed in Section 3.2.3. The AWFCO system utilized by Dow to stop feeding wastes to prevent exceeding permit limits for the unit is discussed in Section 3.2.4.

#### **3.2.1 Waste Forms**

Wastes treated at the Solvents/EDC I plant arrive in liquid or vapor form and are classified as follows:

- Bulk liquids from hazardous waste storage tanks: Compatible wastes, which may arrive by pipe from process areas, are commingled in the hazardous waste storage tanks located in the Solvents/EDC I Plant. The tanks are used for mixing and storage of compatible, non-reactive wastes, and the contents are typically pumped from the hazardous waste storage tanks to the unit.

- Liquids from processes: Wastes may be fed to the unit from pipes, which carry the wastes directly from the process area, without intermediate storage in the Solvents/EDC hazardous waste storage tanks.
- Liquids from containers: Wastes in containers, which may be generated from the Solvents/EDC I Plant and other on-site plants may be fed directly to the unit or into hazardous waste storage tanks prior to feeding to the TTU.
- Tanks and process vents: Hazardous waste storage tanks are vented to the unit. In addition, vents from various process sources are piped to the unit for treatment of organic vapors. When the unit is not operating, the vent lines to the unit are either closed or routed to an alternate vent device.

### **3.2.2 Waste Feeding and Supplemental Fuel**

The unit is equipped with four nozzles to feed liquid waste. The four liquid nozzles utilize either air or steam to atomize the liquid as it is introduced into the incinerator. In addition to the liquid waste feeds, fuel gas (natural gas) is utilized as the auxiliary fuel, and process vents are treated in the unit. There are three vent feed nozzles; all seven nozzles can be operated simultaneously. The total waste feed rate is limited by the RCRA permit liquid waste feed rate limit of 8,700 lb/hr and the NOC limit of 6,965 lb/hr.

Typically waste streams are fed independently through a dedicated nozzle. A nozzle may service a single waste feed stream or campaign several waste feed streams. In this case, the constituent mass feed rates are determined through the measured mass flow rate and feedstream analysis for inclusion in the summation of the total constituent feed rate.

Alternatively, a blend of several waste streams may be delivered to the unit through a single nozzle. The slim nozzle operates in this manner. Wastes are blended or mixed in D-701, then their combined flow rate is measured as they are burned through the slim nozzle. The flow rate of each of the three distinct liquid waste streams is measured individually prior to entering D-701. These flow rates are used to determine the mass fraction of the blended waste contributed by each of the three waste streams. The mass fractions are then used to determine constituent concentration of chlorine, semivolatile metals, low volatile metals, mercury, and ash of the blended mixture. The combined component concentrations and the blended mixture flow rate are used to determine the constituent feed rate one-minute average (OMA) and 12-Hour Rolling Average (12-HRA) to the slim nozzle.

### **3.2.3 Controls of Feedstreams**

Based upon existing permits, Dow has established limitations on waste feeds. Dow maintains instrumentation, which measures the feed rate of hazardous waste, as reflected in Table 3-1.

### **3.2.4 Automatic Waste Feed Cutoff (AWFCO) System**

The AWFCO system is intended to shut off waste feed to the unit whenever operating parameters approach operating limits established from existing permits. This is done by interlocking the fail-safe emergency block valves on the feed systems to the required continuous monitoring devices. The AWFCO system resides in the existing control system and operates continuously. Dow has installed a data historian that communicates continuously with the control system and which calculates one-minute averages (OMAs), HRAs, and 12-HRAs. Additionally, the data historian accesses feed rate data for each feed mechanism and component concentrations of ash, SVM, LVM, Hg, and chlorine for each waste stream. The feed rate and component concentration information are used on a real-time basis, and communicate back to the control system that the component feed rates are below the established maximum feed rates for each component. The data historian is operating in accordance with the HWC MACT.

Dow maintains AWFCOs as required by the Notification of Compliance for the Interim Standards of the HWC MACT in order to prevent adverse air emissions resulting from equipment malfunctions and power outages. The HWC MACT AWFCO parameters and continuous monitoring systems for the F-700 are presented in Table 3-1. Table 3-1 provides detailed information on the devices used to monitor these parameters and their locations on the TTU. The locations of these devices are also shown on the Process Flow Diagram in Figure 3-1. These instruments will also be used to monitor plant operations and record data for the facility operating record during the CPT testing. Instrument calibration will be done according to manufacturer's specifications and as described in the CMS Performance Evaluation Test Plan in Appendix A.

Dow intends to re-submit an Alternative Monitoring Application (AMA) under separate cover. The AMA proposes certain deviations or alternatives to the specific operational parameters described in the HWC MACT.

### **3.3 Air Pollution Control Equipment**

Cooling of the combustion gas and removal of particulate matter and acid gases occurs in the pollution control system shown on Figure 3-1. The air pollution control equipment consists of the following equipment:

- Quench system;
- Packed bed HCl absorber; and
- Packed bed chlorine scrubber.

There are no cleaning practices that occur (other than shutdown) associated with the incinerator or particulate matter control devices that could potentially increase particulate matter.

Maintenance practices associated with the air pollution control equipment are described in the Operations and Maintenance Plan (OMP). Dow uses an internal electronic tracking tool, the Global Engineering Maintenance Tracking System (GEMTS), to assist in managing the maintenance activities for the incinerator. The GEMTS system provides a tool for automatically generating scheduled maintenance requests (i.e., manufacturer-recommended preventative maintenance). In addition, GEMTS system is used as a recordkeeping tool to document the completion of maintenance activities.

#### **3.3.1 Quench System**

Combustion gas exiting the combustion chamber passes through the quench drum where the temperature of the gas stream is quickly reduced. The quench chamber is designed with the combustion and process water used for cooling flow co-currently. flows downward co-current with a process water spray. As the gas passes through the drum, temperatures drop to below 115°C.

The quench chamber shell is constructed of carbon steel and is lined with refractory material. The spray uses a normal flow of 150 gal/minute (gpm) of once-through process water.

#### **3.3.2 Packed Bed HCl Absorber**

After exiting the quench chamber, combustion gas, along with water, enters the HCl absorber. In this 33 foot 3 inch tall by 7 foot diameter Fiberglass Reinforced Plastic (FRP) column, gases are contacted with water in a once-through upward, counter-current pass to remove HCl, metals and particulate, as well as to provide additional cooling. The absorber is a packed column with two packed sections. Pall rings in the upper section and ceramic saddles in the lower section of the absorber. Replacement packing will meet all design requirements for

size and material. Water flow through the absorbers varies to ensure adequate Liquid to Gas (L/G) ratios for the removal of HCl from the combustion gases.

Effluent from the quench drum and HCl absorber are commingled and discharged through a National Pollutant Discharge Elimination System (NPDES)-permitted outfall.

### **3.3.3 Packed Bed Chlorine Scrubber**

The cooled saturated combustion gas from the HCl absorber enters the bottom of the chlorine scrubber for distribution prior to flowing upward through a packed bed scrubber. The chlorine scrubber is counter-current with a water and caustic liquid and is manufactured from FRP.

The 28 foot 4 inch tall by 7 foot diameter scrubber column utilizes a single packed section 10-ft in depth, filled with high-efficiency packing material, to facilitate the removal of chlorine from the combustion gases. Replacement packing will meet all design requirements for size and material. Water and caustic flow downward through the packing as the combustion gases move up the column. At the top of the scrubber, the combustion gas exits. The caustic is a dilute caustic solution commonly referred to as cell effluent and has a sodium hydroxide concentration typically in the 8.9 to 9.5 percent range. Aqueous effluent from the bottom of the scrubber is pH-controlled, and effluent is discharged through an NPDES-permitted outfall.

### **3.3.4 Induced Draft Blower**

Dow utilizes an induced-draft blower to maintain negative pressure throughout the combustion chamber, quench drum, absorber column, and scrubber column. The blower is a non-variable induced draft and has a capacity of 25,300 lb/hr. The blower is rated at 10,000 scfm at 20 inches of water column.

### **3.3.5 Stack**

Dow designed an FRP stack that disperses the combustion gases. The stack, which stands 75 ft above grade is equipped with sample ports and continuous monitor ports for CO and O<sub>2</sub>. Details regarding the stack gas monitoring devices as well as the monitoring devices associated with the Air Pollution Control System (APCS) are included in the Continuous Emissions Monitoring Performance Evaluation Plan (CMS PEP).

**Table 3-1. F-700 Major Process Instrumentation**

Parameter	Method	Location	Ref. No. <sup>1</sup>	Instrument Range	Minimum Acceptance Criteria
Combustion Chamber Temperature Probe (West)	Thermocouple	R-700 west side	4	0-1,600°C	+/- 1% of Span
Combustion Chamber Temperature Probe (South)	Thermocouple	R-700 south side	5	0-1,600°C	+/- 1% of Span
Steam Pressure to Hex Nozzle	Pressure Transmitter	Steam line to hex nozzle	6	0-200 psig	+/- 1% of Span
Hex Feed Flow	Flow Meter	Hex line	7	0-10,000 lb/hr	3% of Rate
EDC 1 Heavies Feed Rate	Flow Meter	EDC 1 Heavies line	8	0-2,200 lb/hr	+/- 1% of Span
Solvent Heavies Feed Rate	Flow Meter	West of D701	9	0-3,000 lb/hr	+/- 1% of Span
Glycol 1 Feed Rate	Flow Meter	Glycol 1 Feed Line	10	0-2,900 lb/hr	+/- 1% of Span
"Taffy" Feed Rate	Flow Meter	Taffy pots	11	0-6,000 lb/hr	+/- 1% of Span
Slim Nozzle Feed Rate	Flow Meter	Slim line	12	0-3,000 lb/hr	+/- 1% of Span
General Waste Feed Rate	Flow Meter	General Waste Tank	13	0-2,500 lb/hr	+/- 1% of Span
D-42 Vent Flow Rate	Flow Meter	D-42 vent	14	0-200 lb/hr	+/- 1% of Span
K-102 Vent Flow Rate	Flow Meter	K-102 vent	15	0-155 lb/hr	+/- 1% of Span
D-700 Vent Flow Rate	Flow Meter	D-700 vent	17	0-1,400 lb/hr	+/- 1% of Span
D-702 Vent Flow Rate	Flow Meter	D-702 vent	18	0-3,000 lb/hr	+/- 1% of Span
Slim Nozzle Steam Pressure	Pressure Transmitter	Steam line to slim nozzle	19	0-200 psig	+/- 1% of Span
Air Pressure to "Taffy" Nozzle	Pressure transmitter	Air line to taffy nozzle	20	0-100 psig	+/- 1% of Span
Steam Pressure to General Waste Nozzle	Pressure Transmitter	General Waste Tank	21	0-200 psig	+/- 1% of Span
C-730 Discharge pH	pH probe	C-730 drain line	22	0-14 pH	+/- 1% of Span
Process Water Flow to C-730	Flow Meter	Process H <sub>2</sub> O line to C-730	23	0-1000 gpm	+/- 1% of Span
Process Water Flow to C-720	Flow Meter	Process H <sub>2</sub> O line to C-720	24	0-1000 gpm	+/- 1% of Span
C-730 Pressure Drop	Differential Pressure transmitter	Across packing in C-730	25	0" - 25"	+/- 1% of Span
C-720 Pressure Drop	Differential Pressure transmitter	Across packing in C-720	26	0" - 25"	+/- 1% of Span
Caustic Flow to C-730	Flow Meter	West of C730	27	0-35 gpm	0.3% of Rate
Stack Gas Flow Rate	Flow Meter	Stack	30	0-6000 acfm	+/- 1% of Span
O <sub>2</sub> Analyzer	Horiba Model ENDA 1250 CEMS	Stack	28	0-25%	3% of Span
CO Analyzer	Horiba Model ENDA 1250 CEMS	Stack	29	0-200 ppm 0-3,000 ppm	3% of Span

<sup>1</sup> These identification numbers are used to indicate the locations of these monitors in Figure 3-1.

## 4.0 Test Design and Protocol

### 4.1 Regulatory Requirements

Under the Clean Air Act (CAA), this CPT Plan is designed to meet the objectives promulgated in 40 CFR 63 Subpart EEE, NESHAPs for HWCs for existing incinerators at §63.1203(a) and §63.1219(a). The test objectives are outlined as follows:

- Demonstrate compliance with the stack gas emissions less than or equal to the §63.1203(a) Interim Standards limits. Emission limits are corrected for moisture and corrected to 7% O<sub>2</sub>:
  - Carbon monoxide: 100 ppmv, dry basis;
  - Total hydrocarbons; 10 ppmv, dry basis, during the DRE test runs;
  - Dioxins and furans: 0.40 ng TEQ/dscm;
  - Particulate matter (PM): 34 mg/dscm (0.015 grains/dscf);
  - DRE (99.99%) of the selected POHC (monochlorobenzene);
  - Mercury: 130 µg/dscm;
  - Semivolatile metals (SVM) (Cd and Pb combined): 240 µg/dscm;
  - Low volatile metals (LVM) (As, Be and Cr combined): 97 µg/dscm; and
  - HCl / Cl<sub>2</sub>: 77 ppmv combined, dry basis;
- Demonstrate compliance with stack gas emissions less than or equal to the §63.1219(a) Permanent Replacement Standards limits. Emission limits are corrected for moisture and corrected to 7% O<sub>2</sub>:
  - Carbon monoxide: 100 ppmv, dry basis;
  - Total hydrocarbons; 10 ppmv, dry basis, during the DRE test runs;
  - Dioxins and furans: 0.40 ng TEQ/dscm;
  - Particulate matter (PM): 0.013 grains/dscf;
  - DRE (99.99%) of the selected POHC (monochlorobenzene);
  - Mercury: 130 µg/dscm;
  - Semivolatile metals (SVM) (Cd and Pb combined): 230 µg/dscm;
  - Low volatile metals (LVM) (As, Be and Cr combined): 92 µg/dscm; and
  - HCl / Cl<sub>2</sub>: 32 ppmv as Cl equivalent, dry basis;
- Establish limits for operating parameters. One set of operating parameter limits will be established which show compliance with the most stringent standards.
- Demonstrate the performance of the continuous monitoring system.

## 4.2 Establishing Operating Parameter Limits

An objective of the HWC MACT is to establish limits for a number of operating parameters while simultaneously demonstrating compliance with the more stringent of the interim or permanent replacement emission standards listed above. These operating parameters are established to ensure compliance with these standards on a continuous basis. Table 4-1 identifies each emission standard and the operating parameter to be monitored to ensure future compliance. This table also presents the averaging time and the basis for these operating parameters.

For certain operating parameters, a limit is established by manufacturer's specification or good engineering practice and this limit will not be demonstrated during the test (c.g., atomization pressure, and pressure drop across the scrubbers). For total hydrocarbons, the emission standard will be demonstrated during the test, but the parameter will not become an operating parameter limit.

Although pH will be the primary demonstration of scrubber performance, an additional limit will be established on the cell effluent (caustic) feed to chlorine feed ratio per the request of the LADEQ. A correlation will be developed based on data generated during the test that will demonstrate adequate free hydroxide concentration to ensure Chlorine removal. During the test, the unit will operate at a minimum pH, and data will be collected from cell effluent and chlorine feed monitoring and alkalinity analyses of both the cell effluent feed and scrubber discharge. This data will be used to establish a minimum ratio that will be below the normal operating range, but still sufficient to ensure adequate caustic flow. Dow will work with LDEQ to determine what the additional AWFCO will be.

A demonstration that cyclonic flow conditions are within acceptable limits will also be performed during low and high stack gas flow rates for each test condition during the CPT.

## 4.3 Test Plan and Approach

All of the objectives described in the preceding Sections 4.1 and 4.2 must be accomplished in the overall test plan. The test plan is designed to meet all these objectives by performing stack testing while operating the incineration unit under two specific test conditions. Stack testing will be conducted in triplicate runs for each test condition. Table 4-2 summarizes the performance and operating objectives and how these test conditions are designed to accomplish those objectives. The HWC MACT comprehensive performance test will include two test conditions that reflect the "extreme range of normal" [40 CFR 63.1206(b)(2)].

#### **4.3.1 Test Condition 1 – Minimum Temperature, Nominal Hazardous Waste, Metals, Chlorine and Ash Feed Rates, and Combustion Gas Flow Rate**

Test Condition 1 is designed to demonstrate DRE of greater than or equal to 99.99% for the selected Principle Organic Hazard Constituent (POHC), monochlorobenzene, while establishing a minimum combustion gas temperature, an acceptable total hazardous waste feed rate and elevated combustion gas flow rate under nominal, rather than extreme operating conditions. Emission standards that will be demonstrated during Test Condition 1 include dioxins and furans, THC, particulate matter, low volatile metals, semivolatile metals, mercury, and HCl/Cl<sub>2</sub>. Several other critical, operating condition parameters are established. The target feed rates and critical operating conditions for Test Condition 1 are presented in Table 4-3. During the CPT, the waste stream feed rates may be modified as necessary to support the primary objective of establishing the TTU operating parameter limitations.

Due to the difficulty in feeding the "Hexes" waste stream, the feed rate during the test will be lower than the extreme range of normal due concern that multiple trips would compromise the integrity of the test due to interruption of operations during testing. Though difficult to inject due to its physical properties, the HEX waste stream is not difficult to burn, and since the POHC is being used to determine the DRE, Dow does not see the necessity of burning high rates of Hexes during the test. However, Dow has agreed in prior conversation with LDEQ to increase the "Hexes" waste feed rate to 1,500 lb/hr from the previous 1,000 lb per hour.

The process vent gas will be fed to the unit during this test condition.

#### **4.3.2 Test Condition 2 – Maximum Hazardous Waste, Metals, Chlorine and Ash Feed Rates, and Maximum Combustion Gas Flow Rate**

Test Condition 2 is designed to demonstrate DRE of greater than or equal to 99.99% for the selected POHC, monochlorobenzene, while establishing the maximum total hazardous waste feed rate and maximum combustion gas flow rate under extreme operating conditions. Test Condition 2 will also demonstrate emission standards for dioxins and furans, THC, particulate matter, low volatile metals, semivolatile metals, mercury, and HCl/Cl<sub>2</sub>. Test Condition 2 target feed rates and critical operating conditions are presented in Table 4-5. During the CPT, the waste stream feed rates may be modified as necessary to support the primary objective of establishing the TTU operating parameter limitations.

#### **4.4 Waste Feed Streams**

The following sections describe the materials to be burned in the TTU unit during the test.

#### **4.4.1 Waste Feed Stream Selection**

The HWC MACT requires a facility to establish "worst-case" operating condition limits. Waste streams that enable worst-case operating conditions for maximum hazardous waste feed rate, maximum chlorine loading, and maximum combustion gas flow rate will be fed to the TTU during Test Conditions 1 and 2. During Test Condition 1, Dow intends to feed Hexes waste, glycol ether/PDC waste (high chlorine, high BTU), and finished carbon tetrachloride (high chlorine, low BTU) to perform the CPT. Process vents will also be burned during Test Condition 1. During Test Condition 2, Dow will burn glycol ether/PDC and the finished carbon tetrachloride stream only so that a maximum chlorine loading is accomplished during Test Condition 2. There will not be any non-hazardous waste streams fed during the CPT; however, Dow will utilize a contractor to spike a metals solution, ash solution, and POHC into the waste streams fed to the TTU. Waste stream spiking is discussed further in Section 4.7.4.

The physical and chemical characterizations of the waste streams fed to the TTU are described in Section 2. All of the waste streams listed in Section 2 were considered for inclusion as feed streams for the CPT, but no other feed stream combination besides the glycol ether/PDC and carbon tetrachloride could readily provide the desired waste feed rate and maximum chlorine loading. The following factors were considered:

- Availability of a sufficient waste inventory;
- Limitations of waste streams that could be fed with the existing liquid waste feed nozzle configuration;
- The potential hazards involved with the sampling of certain waste streams (e.g., Chlorine Taffy stream sampling requires Level A protection); and
- Operational difficulties associated with waste stream characteristics (i.e., Hexes feed is subject to frequent interruption due to line plugging).

#### **4.4.2 Expected Constituent Levels in Natural Gas, Process Air & Other Feed Streams**

Dow has no reason to expect an organic hazardous air pollutant to be present at any level in the natural gas or process air streams.

Dow has a contract with outside suppliers for natural gas. This contract for the natural gas has specifications for the level of particulate matter, sulfur and natural gasoline in the natural gas. The specification for the particulates is that the gas will be free of objectionable liquids and solids, be commercially free of dust, gum-forming constituents, or other liquids or solid matter which might become separated from the gas in the course of transportation through pipelines. Also, the natural gas will not contain more than five grains of total sulfur per one hundred cubic feet of gas. The contract also states that natural gasolines will not be greater than two-tenths gallon per Mcf. Based on this specification, sampling the natural gas is not warranted. Also, the air used for combustion purposes in the TTU is atmospheric air and again Dow feels that this air does not contain regulated constituents at levels of concern.

The composition of the process vents varies and includes nitrogen and various chlorinated organic compounds as well as HCl and chlorine. Historically, the vent streams (excluding nitrogen) only account for a small percentage of the total organic mass loading in the waste feed. This is based on the total mass of vent streams fed to the TTU between January 1 and September 30, 2004 (3.4 M lbs of which 2.7 M lbs is nitrogen). The total mass of waste fed to the TTU during the same period was 17.35 M lbs.

Dow will include vent streams in Test Condition 1. Dow will not characterize the vents during, but will use the data presented in Table 2-7 along with data from the April 26<sup>th</sup> through May 4<sup>th</sup>, 2005 CPT to determine the chlorine contribution from the vents. Dow will not include vent streams in Test Condition 2 as the goal is to maximize waste feed rates and chlorine loading. The BTU content of these vents, although minimal, would increase heating value in the burner without adding to the hazardous waste feed rate. Therefore, all heat input to the TTU during Test Condition 2 will be from liquid hazardous waste feeds.

#### **4.4.3 POHC Selection Rationale**

The Dow TTU manages the waste streams described in Section 2. The primary rationale for Principal Organic Hazardous Constituent (POHC) selection is representation of the waste streams and difficulty to be incinerated. As the TTU only burns liquid hazardous waste, and these wastes have a high concentration of chlorine, a chlorinated, liquid POHC must be selected. The POHC chosen for the Comprehensive Performance Test is monochlorobenzene.

EPA has developed a thermal stability ranking system based on laboratory studies. The thermal stability ranking system has divided organic compounds into seven thermal stability

classes, with Class 1 compounds being the most stable and difficult to burn. The HWC MACT also requires that at least one POHC be on the HAPs list (42 U.S.C. 7412(b)(1)).

Monochloro-benzene is a Class 1 compound and a HAP, and successful demonstration of 99.99% DRE of this POHC will allow Dow to burn any hazardous organic compound in the TTU.

Monochlorobenzene will be spiked to the TTU during both CPT Test Conditions to substantiate the 99.99% DRE. The spiking level will be set to ensure detectability of the POHC in the stack gases. POHC is not expected to be present in the waste feeds selected.

#### **4.4.4 Waste Feed Spiking**

Dow intends to introduce spiking solutions into the waste streams during Test Conditions 1 and 2 to elevate the concentrations of these compounds in the stack gas above detection limits. The spiking materials will be shipped in sealed containers accompanied by certificates of analysis (COAs) and stored in a secure area.

Spiking solutions will be introduced to ensure that the POHC is in significant quantities in the feed streams to demonstrate 99.99% DRE, and that low-volatile and semi-volatile metals, mercury, and ash are introduced at appropriate levels. The POHC will be fed as a neat liquid. The metals and ash solutions will be fed as a single dispersion with a known concentration of chromium, lead, mercury, and ash.

The spiking system consists of a variable-stroke, diaphragm-type, positive displacement pump, a calibrated weigh scale, a mass flow meter, and a PC-based injection rate control and data acquisition system. A drum of the spiking solution is placed on the weigh scale and connected with ¾" flexible suction hose to a skid-mounted metering pump and the mass flow meter. At the skid, the spiking solution flows through the pump and the mass flow meter, and into the ½" flexible delivery hose, which is connected to the waste feed line. Spiking rate will be adjusted by modulating stroke on the variable-stroke, diaphragm pump.

Spiking rate is measured using two accurate, independent, and complementary technologies: 1) weigh scale and 2) mass flow meter. The complementary strengths of these technologies will be utilized during this test, i.e., since the accuracy of a weigh scale can be easily demonstrated using NIST-traceable standards, it will be used as the official spiking rate measurement device, and since the mass flow meter provides a direct measurement of flow rate, it will be used to control pump stroke as well as the backup spiking rate measurement device.

The spiking system will be manned by trained personnel at all times in order to shut down the spiking equipment in the event of a waste feed cutoff as well as monitor the continuing operation of the spiking system.

#### 4.4.4.1 POHC Spiking

During Test Conditions 1 and 2, the liquid POHC (monochlorobenzene) will be spiked neat into the liquid waste stream to assure a POHC feed rate of 60 pounds per hour. The amount of POHC spike provides the minimum feed rate to ensure POHC concentration above the method detection limits for the volatile organic stack sampling trains and the required minimum DRE (99.99%). The target emission rate was selected to be at least ten times the method detection limit for a POHC to ensure that each POHC will be measured in the emissions. This safety factor of ten times the detection is recommended by EPA guidance.

For Test Condition 2 (highest stack gas flow rate), assuming a stack gas flow rate of 4,075 dscf/min (based on the April 2005 CPT) and the quantity of chlorobenzene collected was at the method detection limit, a total of 20 nanograms (10 nanograms x 2 tubes) would be collected. Assuming the volume of stack gas that passed through the VOST tubes was 20 liters, then the following calculations illustrate the determination of DRE:

#### Stack Gas Concentration of Chlorobenzene (grams/dscm)

$$\frac{2.6 \text{ ng}}{20 \text{ L}} \times \frac{1 \text{ g}}{10^9 \text{ ng}} \times \frac{1000 \text{ L}}{\text{dscm}} = \frac{1.3 \times 10^{-7} \text{ g}}{\text{dscm}}$$

#### Chlorobenzene Emission Rate (lbs/hr)

$$\frac{1.3 \times 10^{-7} \text{ g}}{\text{dscm}} \times \frac{0.028317 \text{ dscm}}{\text{dscf}} \times \frac{4,075 \text{ dscf}}{\text{min}} \times \frac{1 \text{ min}}{60 \text{ sec}} = \frac{2.50 \times 10^{-7} \text{ g}}{\text{sec}}$$

$$\frac{2.50 \times 10^{-7} \text{ g}}{\text{sec}} \times \frac{1 \text{ lb}}{453.59 \text{ g}} \times \frac{3,600 \text{ sec}}{\text{hr}} = \frac{1.98 \times 10^{-6} \text{ lbs}}{\text{hr}}$$

#### POHC DRE Calculation

$$\text{DRE} = \left( 1 - \frac{W_{\text{out}}}{W_{\text{in}}} \right) \times 100$$

$$DRE = \left( 1 - \frac{1.98 \times 10^{-6}}{60} \right) \times 100$$

$$DRE = 99.99999\%$$

$$DRE \geq 10 \times 99.99\%$$

#### 4.4.4.2 Ash Spiking

During Test Conditions 1 and 2, ash will be introduced to the liquid waste feed by a spiking feed system as described in Section 4.4.4. The ash (approximately 25% by weight titanium dioxide) will be spiked along with the metals (see Section 4.4.4.3) as a single dispersion. The ash spiking solution feed rates are presented in Tables 4-3 and 4-4. The amount of ash spiked provides the minimum feed rate to ensure ash concentration above the method detection limits for particulate matter in the stack gases assuming a system removal efficiency of 96%. The target emission rate was selected to be at least ten times the method detection limit for ash to ensure it will be measured in the emissions. This factor of ten times the detection is recommended by EPA guidance.

#### 4.4.4.3 Metals Spiking

Metals are spiked in the waste feed in order to determine metals feed rate limits and demonstrate compliance with the metals emission standards. The emissions of each metal will be above each respective detection limit. The minimum emission rates were selected to be above detection limits and at stack concentrations less than the HWC MACT standards.

During Test Conditions 1 and 2, a low volatility metal (LVM), chromium (Cr); a semivolatile metal (SVM), lead (Pb); and mercury (Hg) will be introduced to the liquid waste by a spiking feed system as described in Section 4.4.4. The metals (as oxides) will be part of a single dispersion along with the ash. The SVM and LVM metals spiking solution will be fed at the rates presented in Tables 4-3 and 4-4. During the CPT, the actual spiking rates will remain constant, therefore simplifying the test procedures and always meeting or exceeding the target feed rates. The total metals feed rates will be calculated to include any metals detected in the waste streams.

Table 4-5 presents the anticipated detection limits for the stack determinations, as well as the calculated emission rates and estimated SREs for Test Condition 1. Table 4-6 presents the anticipated detection limits for the stack determinations, as well as the calculated emission rates and estimated SREs for Test Condition 2.

#### 4.5 System Operation to Achieve Steady-state Conditions

The comprehensive performance testing requirements in 63.1207(g)(1)(iii) require that prior to obtaining performance test data, the TTU must operate under performance test conditions until a steady-state condition has been achieved. The rule places emphasis on the operating parameters for which a limit is to be established. During the CPT, sampling will not be initiated without the following conditions being met:

- The set point of any operating parameter will not be modified for a period of one hour;
- The feed rate(s) of liquid wastes (except hexes) will not have changed more than the lesser of 5% or 25 lb/hr for a period of 15 minutes. The feed rate of the hexes waste stream will not have changed more than 15% for a period of 15 minutes;
- Waste feed spiking will have been established at the appropriate feed rates for at least 1 hour prior to testing;
- Variability of combustion air flow at  $\pm 3\%$  of set point;
- Variability of C-720 Water flow at  $\pm 10\%$  of set point;
- Variability of C-730 Water flow at  $\pm 10\%$  of set point;

- Variability of C-730 Bottoms pH at  $\pm 0.5$  pH units from set point; and
- Temperature variability of  $\pm 3\%$  of set point.
- C-720 absorber differential pressure to  $\pm 50\%$  between high and low DP pressure readings over 5 minutes

#### 4.6 Determination of Hazardous Waste Residence Time

A determination of the hazardous waste residence time must be part of the CPT. The Dow TTU primarily burns liquids with some gaseous vents. Under these conditions, the hazardous waste residence time is essentially equal to the residence time of the gas through the combustion chamber. Residence time is calculated using the following equation:

$$RT = V_s/F$$

$$V_s = V * (528/(T+460))$$

Where:

- V = Volume of the Combustion Chamber = 795 cf,
- F = Volumetric Flow Rate of the Flue Gas = 4,075 scfm,
- $V_s$  = Standard Volume of Gas in Combustion Chamber = 177.3 scf, and
- T = Temperature of Combustion Chamber ( $^{\circ}$ F) = 1,908 $^{\circ}$ F.
- RT = Residence Time = ~2 sec

#### 4.7 Extrapolation of Metals Feed Rate Limits

The SVM, LVM, and mercury feed rate limits may be increased beyond that demonstrated in the CPT using extrapolation as allowed by 63.1209(l)(1)(i) and (n)(2)(ii), recognizing that extrapolated feed rate limits cannot exceed historical levels of these metals in waste feed streams to the TTU. Dow will demonstrate compliance with the MACT emission standard for SVM, LVM, and mercury at a high enough emission level to exceed the detection limits of the analytical instrumentation. A linear relationship is then assumed for the relationship between the increase in the metals feed rate and the level of emissions up to the emission standard. The SVM, LVM, and mercury during the CPT ( $F_{Metal}$ ). The SVM, LVM, and mercury feed rate limit ( $F_{Limit}$ ) is calculated by multiplying the feed rate by the SVM, LVM, or mercury standard ( $E_{Standard}$ ) and dividing by the stack concentration of SVM, LVM, or mercury ( $E_{metal}$ ) measured during Test Condition 2 of the CPT as follows:

$$\left( \frac{F_{Limit}}{F_{Metal}} \right) = \left( \frac{E_{Standard}}{E_{Metal}} \right)$$

$$F_{Limit} = F_{Metal} \times \left( \frac{E_{Standard}}{E_{Metal}} \right)$$

Where:

$F_{Limit}$  = Feed rate limit of SVM, LVM, or mercury;

$F_{Metal}$  = Feed rate of SVM, LVM, or mercury;

$E_{Metal}$  = Emission concentration of SVM, LVM, or mercury during CPT Test Condition 2; and

$E_{Standard}$  = HWC MACT standard for SVM, LVM, or mercury.

For Mercury, the extrapolated feed rate limits will be no more than 3 times the historical feed rate limits. Based on the 2004 waste data contained in Tables 2-1 – 2-8, Dow anticipates the feed rate limit to be approximately 0.0007 lb/hr, but will re-evaluate using the new CPT data generated during the test.

#### 4.8 AWFCO System During the CPT

A primary objective of the CPT is to establish limits for operating parameters that ensure compliance with the emission standards during subsequent operations. Consistent with this objective, the rules allow for an exception from current operating parameter limits established under 40 CFR 63.1209 during subsequent comprehensive performance testing and associated pretesting (40 CFR 63.1207(h)). Additionally, 40 CFR 270.42(k) provides for the waiver of RCRA operating permit limits for the performance of HWC MACT CPT. The AWFCO system will be modified to waive the limits for the parameters to be established for a maximum of 720 hours prior to the CPT and during the pre-testing period to optimize operation of the F-700 TTU.

#### 4.9 Continuous Monitoring System Performance Evaluation

A Continuous Monitoring System (CMS) must be used to establish, monitor, and record operating parameters from throughout the incineration system. A CMS Performance Evaluation Test Plan (CMS PETP) that details each CMS for the variety of monitored parameters is provided as Appendix A. The operating parameters to be monitored by a CMS and the equipment used to monitor these parameters are presented in Table 3-1.

#### 4.10 Request for Approval to Use EPA Method 23 for PCDDs/PCDFs

Dow is requesting approval to use EPA Method 23 for the sampling and analysis of PCDDs/PCDFs during the CPT. This unit does not emit carbonaceous particulate matter, and is

not equipped with activated carbon injection, therefore EPA Method 23 is suitable. The F-700 previously used SW-846 Method 0023A to test for PCDDs/PCDFs as part of the CPT conducted in April 2005. The results from the April 2005 CPT showed PCDDs/PCDFs concentrations of 0.00140, 0.00359, 0.00226, 0.00744, 0.00494, and 0.00226 ng TEQ/dscm, corrected to 7% oxygen. These results are approximately two orders of magnitude below the dioxin/furan standard for an incinerator. Additionally, the front half of the sampling train showed low levels of PCDDs/PCDFs.

**Table 4-1. 40 CFR 63 Subpart EEE Emission Standards and Operating Parameter Limits**

HWC MACT Standard	Parameter	HWC MACT Monitoring Basis	Limit Basis
CO, THC	Maximum CO - corrected to 7% O <sub>2</sub>	HRA	Emission Standard
DRE, PCDDs/PCDFs	Minimum combustion chamber temperature	HRA	CPTA
DRE, PCDDs/PCDFs, PM, SVM, LVM, Hg, HCl/Cl <sub>2</sub>	Maximum stack gas flow rate	HRA	CPTM
DRE, PCDDs/PCDFs	Maximum total waste feed rate (includes pumpable and non-pumpable)	HRA	CPTM
DRE	Minimum atomizing steam/air pressure	HRA	MS
PM	Maximum ash feed rate in all feedstreams	12-HRA	CPTM
SVM, LVM	Maximum SVM (Cd and Pb) feed rate in all feedstreams	12-HRA	CPTA/EXT
SVM, LVM	Maximum LVM (arsenic, beryllium, chromium) feed rate in all feedstreams and	12-HRA	CPTA/EXT
HCl/Cl <sub>2</sub> , SVM, LVM	Maximum HCl/Cl <sub>2</sub> feed rate in all feedstreams	12-HRA	CPTA
Hg	Maximum mercury feed rate in all feedstreams	12-HRA	CPTA/EXT
Fugitives	Maximum combustion chamber pressure	Combustion chamber is completely sealed.	
PM, SVM, LVM, Hg, HCl/Cl <sub>2</sub>	Minimum chlorine scrubber make-up water flow rate	HRA	CPTA
PM, SVM, LVM, Hg, HCl/Cl <sub>2</sub>	Minimum absorber make-up water flow rate	HRA	CPTA
Hg, HCl/Cl <sub>2</sub>	Minimum chlorine scrubber liquid to gas ratio (L/G)	HRA	CPTA
Hg, HCl/Cl <sub>2</sub>	Minimum absorber liquid to gas ratio (L/G)	HRA	CPTA
PM, SVM, LVM, Hg, HCl/Cl <sub>2</sub>	Minimum tank water level	AMA Waiver (fixed pipe, automatic overflow)	
HCl/Cl <sub>2</sub>	Minimum chlorine scrubber water pH	HRA	CPTA
HCl/Cl <sub>2</sub>	Minimum absorber pH	HRA	CPTA
HCl/Cl <sub>2</sub>	Minimum cell effluent to chlorine ratio	HRA	GEP
Hg, HCl/Cl <sub>2</sub>	Minimum chlorine scrubber pressure drop	HRA	MS
Hg, HCl/Cl <sub>2</sub>	Minimum absorber pressure drop	AMA Waiver	
Hg, HCl/Cl <sub>2</sub>	Minimum absorber liquid feed pressure	AMA Waiver	
Hg, HCl/Cl <sub>2</sub>	Minimum chlorine scrubber liquid feed pressure	AMA Waiver	

CPTA = Established during the CPT as the average of test run averages

CPTM = Established during the CPT as the average of test run maximums

EXT = Limit established by extrapolating CPT results

GEP = Good engineering practice

MS = Manufacturer's specification

NA = Not applicable

**Table 4-2. Applicable Test Objectives for the Comprehensive Performance Tests**

	Test Condition 1	Test Condition 2
<b>Performance Objectives</b>		
DRE	X	X
Carbon Monoxide (<100 ppmv)	X	X
Hydrocarbons (<10 ppmv)	X	X
Dioxins and Furans	X	X
PM		X
Low Volatile Metals and Semivolatile Metals		X
Hg		X
HCl/Cl <sub>2</sub>		X
<b>HWC MACT Operating Parameter Objectives</b>		
Maximum Total Hazardous Waste Feed Rate		X
Minimum Combustion Gas Temperature	X	
Maximum Stack Gas Flow Rate		X
Maximum Ash Feed Rate		X
Hazardous Waste Firing System Parameters: Minimum Atomizing Steam/Air Pressure		X <sup>a</sup>
Maximum Feed Rate of Mercury		X
Maximum Feed Rate of Semivolatile Metals (Pb and Cd)		X
Maximum Feed Rate of Low Volatile Metals (As, Be, and Cr)		X
Maximum Feed Rate of Total Chlorine and Chloride		X
Minimum chlorine scrubber make-up water flow rate		X
Minimum absorber make-up water flow rate		X <sup>b</sup>
Minimum chlorine scrubber liquid to gas ratio (L/G)		X
Minimum absorber liquid to gas ratio (L/G)		X
Minimum tank water level	AMA Waiver (fixed pipe, automatic overflow) <sup>b</sup>	
Minimum chlorine scrubber water pH		X
Minimum absorber pH	AMA Waiver	
Minimum chlorine scrubber pressure drop		X
Minimum scrubber cell effluent to chlorine ratio		X <sup>b</sup>
Minimum absorber pressure drop	AMA Waiver <sup>b</sup>	
Minimum absorber liquid feed pressure	AMA Waiver <sup>b</sup>	
Minimum chlorine scrubber liquid feed pressure	AMA Waiver <sup>b</sup>	

<sup>a</sup> Limit is established in accordance with manufacturer's specification.

<sup>b</sup> Selected alternative under request by alternative monitoring application.

**Table 4-3. Test Condition 1 – Feed Rates and Operating Conditions**

Parameter	Units	Anticipated HWC MACT Limit	Target Rate
Total Liquid Hazardous Waste Feed Rate	lb/hr	6,400	5,250
- Glycol Ether/PDC	lb/hr	NA	1,250
- Carbon Tetrachloride	lb/hr	NA	2,500
- Hexes	lb/hr	NA	1,500
Process Vents Feed Rate	lb/hr	None	500
Maximum Ash Feed Rate	lb/hr	3.5	2.8
Maximum Chlorine Feed Rate	lb/hr	4,559	4,000
POHC Spiking Rate <sup>1</sup>	lb/hr	None	60
Hg Feed Rate	lb/hr	0.0007 <sup>1</sup>	0.002
SVM Feed Rate <sup>5</sup>	lb/hr	3	0.0030
LVM Feed Rate <sup>6</sup>	lb/hr	3	0.0125
Minimum Combustion Gas Temperature	°C	1,042	1,042
Maximum Stack Gas Flow Rate	acfm	4,246	3,900
Minimum Hazardous Waste Firing System Parameter/Atomizing Steam/Air Pressure	psig	40	As necessary
Minimum Chlorine Scrubber Freshwater Make-up Rate/Chlorine Scrubber Liquid Flow Rate (C-730)	gpm	500	500
Minimum HCl Absorber Freshwater Make-up Rate/HCl Absorber Liquid Flow Rate (C-720)	gpm	100	100
Minimum Chlorine Scrubber Liquid to Gas Ratio (L/G)	gpm/acfm	0.118	0.128
Minimum Absorber Liquid to Gas Ratio (L/G)	gpm/acfm	0.024	0.026
Minimum Tank Level		AMA Waiver (fixed pipe, automatic overflow)	
Minimum Chlorine Scrubber Water pH	Unitless	8.5	8.5
Minimum Absorber Water pH	Unitless	AMA Waiver	
Minimum Chlorine Scrubber Cell Effluent to Chlorine Feed Ratio	Unitless	TBD	TBD
Minimum Chlorine Scrubber Pressure Drop	inches H <sub>2</sub> O	2	>2
Minimum HCl Absorber Pressure Drop		AMA Waiver	
Minimum Chlorine Scrubber Liquid Feed Pressure		AMA Waiver	
Minimum HCl Absorber Liquid Feed Pressure		AMA Waiver	
Maximum Stack Carbon Monoxide Concentration	ppmv, dry, 7% O <sub>2</sub>	100	100
Maximum Stack Total Hydrocarbon Concentration <sup>4</sup>	ppmv, dry, 7% O <sub>2</sub>	10	10

<sup>1</sup> The MACT standard for mercury is 130 µg/dscm corrected to 7% oxygen as measured in the stack. The feed rate limit will be determined after quantifying stack emissions and extrapolating to the emission standard, but no greater than 3x the historical feed rate average. The anticipated feed rate limit is based on 2004 feed and analytical data.

<sup>2</sup> The MACT standard for semivolatile metals is 240 µg of Cd and Pb combined/dscm corrected to 7% oxygen as measured in the stack. The feed rate limit will be determined after quantifying stack emissions and extrapolating to the emission standard.

<sup>3</sup> The MACT standard for low volatile metals is 97 µg of As, Be, and Cr combined/dscm corrected to 7% oxygen as measured in the stack. The feed rate limit will be determined after quantifying stack emissions and extrapolating to the emission standard.

<sup>4</sup> This operating parameter is to be demonstrated during the CPT only and will not become a CMS.

<sup>5</sup> SVM includes cadmium and lead; however, the bulk of the SVM fed to the combustion unit will be from lead spiking.

<sup>6</sup> LVM includes arsenic, chromium, and beryllium; however, the bulk of the LVM fed to the combustion unit will be from chromium spiking.

**Table 4-4. Test Condition 2 – Feed Rates and Operating Conditions**

Parameter	Units	Anticipated HWC MACT Limit	Target Rate
Total Liquid Hazardous Waste Feed Rate	lb/hr	6,400	6,400
- Glycol Ether/PDC	lb/hr	NA	1,300
- Carbon Tetrachloride	lb/hr	NA	5,100
Process Vents Feed Rate	lb/hr	None	None
Natural Gas Feed Rate	scfm	None	As necessary
Maximum Ash Feed Rate	lb/hr	3.5	3.5
Maximum Chlorine Feed Rate	lb/hr	4,559	4,559
POHC Spiking Rate	lb/hr	None	60
Hg Feed Rate	lb/hr	0.0007 <sup>1</sup>	0.004
SVM Feed Rate <sup>5</sup>	lb/hr	2	0.006
LVM Feed Rate <sup>6</sup>	lb/hr	3	0.025
Minimum Combustion Gas Temperature	°C	1,042	1,220
Maximum Stack Gas Flow Rate	acfm	4,246	4,246
Minimum Hazardous Waste Firing System Parameter/Atomizing Steam/Air Pressure	psig	40	As necessary
Minimum Chlorine Scrubber Freshwater Make-up Rate/Chlorine Scrubber Liquid Flow Rate (C-730)	gpm	500	500
Minimum HCl Absorber Freshwater Make-up Rate/HCl Absorber Liquid Flow Rate (C-720)	gpm	100	100
Minimum Chlorine Scrubber Liquid to Gas Ratio (L/G)	gpm/acfm	0.118	0.118
Minimum Absorber Liquid to Gas Ratio (L/G)	gpm/acfm	0.024	0.024
Minimum Tank Level	-	AMA Waiver (fixed pipe, automatic overflow)	
Minimum Chlorine Scrubber Water pH	Unitless	8.5	8.5
Minimum Absorber Water pH	-	AMA Waiver	
Minimum Chlorine Scrubber Cell Effluent to Chlorine Feed Ratio	Unitless	TBD	TBD
Minimum Chlorine Scrubber Pressure Drop	Inches H <sub>2</sub> O	2	As necessary
Minimum HCl Absorber Pressure Drop	-	AMA Waiver	
Minimum Chlorine Scrubber Liquid Feed Pressure	-	AMA Waiver	
Minimum HCl Absorber Liquid Feed Pressure	-	AMA Waiver	
Maximum Stack Carbon Monoxide Concentration	ppmv, dry, 7% O <sub>2</sub>	100	100
Maximum Stack Total Hydrocarbon Concentration <sup>4</sup>	ppmv, dry, 7% O <sub>2</sub>	10	10

<sup>1</sup> The MACT standard for mercury is 130 µg/dscm corrected to 7% oxygen as measured in the stack. The feed rate limit will be determined after quantifying stack emissions and extrapolating to the emission standard, but no greater than 3x the historical feed rate average. The anticipated feed rate limit is based on 2004 feed and analytical data.

<sup>2</sup> The MACT standard for semivolatile metals is 240 µg of Cd and Pb combined/dscm corrected to 7% oxygen as measured in the stack. The feed rate limit will be determined after quantifying stack emissions and extrapolating to the emission standard.

<sup>3</sup> The MACT standard for low volatile metals is 97 µg of As, Be, and Cr combined/dscm corrected to 7% oxygen as measured in the stack. The feed rate limit will be determined after quantifying stack emissions and extrapolating to the emission standard.

<sup>4</sup> This operating parameter is to be demonstrated during the CPT only and will not become a continuously monitored parameter for normal compliance demonstration.

<sup>5</sup> SVM includes cadmium and lead; however, the bulk of the SVM fed to the combustion unit will be from lead spiking.

<sup>6</sup> LVM includes arsenic, chromium, and beryllium; however, the bulk of the LVM fed to the combustion unit will be from chromium spiking.

**Table 4-5. Stack Metals Detection Limits, Emission Rates, and System Removal Efficiencies – Test Condition 1**

	Lead	Chromium	Mercury
Stack Detection Limit (µg/sample)	2	2	7.04
Stack Volume Collected (dscf)	60	60	60
Concentration at RL (µg/dscf)	0.033	0.033	0.12
Stack Flow Rate (dscfm)	4500	4500	4500
Emission Rate at RL (lbs/hr)	0.000020	1.98E-05	6.99E-05
Target Spiking Rate (lbs/hr)	0.0048	0.020	0.003
Estimated SRE	94	97	93
Estimated Stack Emission Rate (lbs/hr)	0.00029	0.00060	0.00021
Estimated Rate:Emission Rate @ RL Ratio	14.5	30.2	3.0
Est. Stack Gas Conc. % of MACT Limit	10.0%	51.8%	13.5%

**Table 4-6. Stack Metals Detection Limits, Emission Rates, and System Removal Efficiencies – Test Condition 2**

	Lead	Chromium	Mercury
Stack Detection Limit (µg/sample)	2	2	7.04
Stack Volume Collected (dscf)	60	60	60
Concentration at RL (µg/dscf)	0.033	0.033	0.12
Stack Flow Rate (dscfm)	5333	5333	5333
Emission Rate at RL (lbs/hr)	0.000024	0.000024	0.000083
Target Spiking Rate (lbs/hr)	0.006	0.025	0.004
Estimated SRE	94	97	93
Estimated Stack Emission Rate (lbs/hr)	0.00036	0.00075	0.00028
Estimated Rate:Emission Rate @ RL Ratio	15.3	31.9	3.4
Est. Stack Gas Conc. % of MACT Limit	10.5%	54.6%	15.1%

## 5.0 Sampling, Analysis, and Monitoring Procedures

The CPT will be conducted under two operating conditions to demonstrate the system performance and to establish appropriate permit operating limits:

- Test Condition 1 – Low Temperature/Nominal Waste and Process Vent Feed Rates/Nominal Metals Feed Rates/ Nominal Chlorine Feed Rates/Nominal Ash Feed Rates/Nominal Combustion Gas Flow Rate and
- Test Condition 2 – Maximum Waste Feed Rates/Maximum Metals Feed Rates/ Maximum Chlorine Feed Rates/Maximum Ash Feed Rates/Maximum Combustion Gas Flow Rate

Test Condition 1 is designed to demonstrate DRE, carbon monoxide, total hydrocarbons, PM, SVM, LVM, mercury, HCl/Cl<sub>2</sub>, and dioxins and furans standards while the plant is operating under an acceptable, but more restrictive set of operating conditions. The purpose of Test Condition 1 is to establish the minimum combustion chamber temperature simultaneously with an acceptable total hazardous waste feed rate and maximum combustion gas flow rate in the event that the unit fails to meet the standards under the maximum rates and conditions of Test Condition 2. Minimum acceptable feed rates of metals, chlorine and ash will also be demonstrated at this reduced-rate test condition.

Test Condition 2 is designed to demonstrate compliance with the HWC MACT performance standards and will be conducted at maximum hazardous waste feed rate and maximum combustion gas flow rate. Test Condition 2 will be also be conducted at maximum liquid waste feed rates to demonstrate “worst case” for particulate matter, hydrogen chloride, chlorine, mercury, semivolatile metals, and low volatile metals emissions control.

Both test conditions will be comprised of at least three replicate sampling runs. Table 5-1 summarizes the parameters that will be measured during each test condition and the frequency of each measurement.

**Table 5-1. Sample Frequency**

Stream/Parameter	Sample Frequency	
	Test Condition 1	Test Condition 2
<b>Waste Feeds</b>		
Composition <sup>2</sup>	3	3
Heating Value, Viscosity, Density	3	3
Metals <sup>3</sup>	3	3
<b>Process Vents</b>		
Organic Chlorine	3	NA
<b>Stack Gas</b>		
POHC <sup>1</sup>	3	3
Particulate Matter/HCl/Cl <sub>2</sub>	3	3
O <sub>2</sub> , CO <sub>2</sub> , Moisture	3	3
Metals <sup>3</sup>	3	3
Dioxins /Furans	3	3
CO, O <sub>2</sub> <sup>4</sup>	Continuous	Continuous
Total Hydrocarbons	Continuous	Continuous
<b>Scrubber Liquid</b>		
Cell Effluent	3	3
Scrubber Effluent	3	3

<sup>1</sup> POHC is monochlorobenzene.

<sup>2</sup> Composition includes chlorine and ash.

<sup>3</sup> Metals analysis is for the HWC MACT metals (Pb, Cd, As, Cr, Be and Hg).

<sup>4</sup> Plant monitors.

## 5.1 Sampling Locations and Procedures

Samples are collected of waste feed streams and stack gas during the CPT testing. This section describes the sampling methods that will be employed. Table 5-2 summarizes the sampling methods for each stream and the parameters that will be determined. Only Louisiana Environmental Laboratory Accreditation Program (LELAP) accredited stack sampling companies will be utilized during this sampling effort. Since most of the proposed methods are standard reference methods, only brief, summary type descriptions are presented. More detailed descriptions can be found in the indicated reference documents and in the Quality Assurance Project Plan (see Appendix B) for the CPT.

Methods cited in this document refer to the latest promulgated method at the time this document was prepared. Specific method numbers and suffix designations used in the implementation of the project will be documented in the final report.

Table 5-2. Sampling Matrix – Test Conditions 1 &amp; 2

Stream	Sampling Method	Sampling Frequency	Compositing Approach	Analytical Parameters
Waste Feeds	Tap (S-004)	Every 15 minutes	Composite all subsamples from each test period	Composition Heating Value Density Viscosity Metals PCBs
Process Vents	TO-14A	Once per run	Not Required	Organic Chlorine
Spiking Solution	Tap (S-004)	Beginning and end of each test period	Not Required	Archive
Stack Gas	EPA Method 2	Concurrent with isokinetic sampling	Not Required	Flow rate
	EPA Method 3A	Concurrent with isokinetic sampling	Not Required	O <sub>2</sub> , CO <sub>2</sub>
	EPA Method 4	Concurrent with isokinetic sampling	Not Required	Moisture
	EPA Method 5/26A	2+ hour collected isokinetically	Not Required	Particulate Matter HCl/Cl <sub>2</sub>
	VOST (SW-846 Method 0030)	4 pairs (1 pair every 40 minutes; 20L per pair) of adsorbent tubes per run	Not Required	Volatile Organic POHC
	EPA Method 23	3+ hour collected isokinetically	Not Required	Dioxins and Furans
	EPA Method 29	2+ hour collected isokinetically	Not Required	Metals
	EPA Method 25A	Continuous	Not Required	THC
	Process CEMs	Continuous	Not Required	CO, O <sub>2</sub>
Scrubber Liquid: -Cell Effluent -Blowdown	Tap (S-004)	Once per run  Once per run	Not Required	Analysis of Cell Effluent for Free Hydroxides

### **5.1.1 Liquid Sampling Procedures**

Samples of the liquid waste feed streams and spiking materials will be collected in amber glass bottles with Teflon™ cap liners. Pre-cleaned bottles will be purchased and used to collect the samples. A Standard Operating Procedure (SOP) for sampling liquid waste feeds is provided in Appendix A of the QAPP.

Liquid samples will be collected using the tap sampling procedure specified in U.S. EPA Method S004, "*Sampling and Analysis Methods for Hazardous Waste Combustion.*" The sample tap will be flushed each time (allowed to flow briefly) before the sample is collected. This will ensure that any stagnant accumulation of solids, or other contaminants that may be present in the tap, does not affect the sample integrity or its representation of the stream being sampled. Sample tap flushings will be collected and stored in a container that is compatible with the material being sampled and will be managed and disposed of according to RCRA hazardous waste regulations.

Samples of the liquid streams will be collected every 15 minutes during each test run. At 15-minute intervals throughout each test period, a grab sample, approximately 100-ml, of each liquid stream will be collected. The grab samples collected will be composited on site to provide one sample per test run. Table 5-2 summarizes the parameters to be determined during each test condition.

Samples of scrubber cell effluent feed and blow down will be collected once per each test run. A grab sample of 200-ml will be collected for each stream. Table 5-2 summarizes the parameters to be determined during each test condition.

### **5.1.2 Process Vent Sampling Procedures**

The process vent stream will be sampled during Test Condition 1 using EPA Method TO-14A for organic chlorine. Process vent gas will be withdrawn from a sample tap into a evacuated, passivated canister. A detailed description of the sampling methodology is provided in the QAPP.

### **5.1.3 Stack Gas Sampling Procedures**

The stack gas emissions will be collected for determination of the parameters indicated in Table 5-2. Sampling trains will be run simultaneously using the methods described below.

#### **5.1.3.1 Sample Port Location**

The stack is 75 feet high and has an inside diameter of 24 inches at the elevation of the sampling ports. There are three port levels on the stack located at elevations of 18 feet 8 inches, 20 feet 8 inches, and 22 feet 5 inches. There are two other port levels located at an elevation of about 36 feet and 37 feet. Several of the ports located at the lower elevations are occupied with CEMS probes and flow meters. Dow has confirmed that the number of ports available for sampling is adequate to support this test effort. The number of sampling points at the various port locations is to be determined in accordance with EPA Method 1 and is discussed in more detail in the QAPP.

#### **5.1.3.2 EPA Methods 2, 3A and 4 (Flow Rate, Gas Composition, and Moisture)**

Concurrent with the performance of all isokinetic sampling trains, measurements are made to determine gas flow rate by 40 CFR Part 60, Appendix A, Method 2, gas composition by Method 3A, and moisture by Method 4.

#### **5.1.3.3 EPA Method 5 (PM)**

The stack gas will be sampled for determination of particulate matter using 40 CFR Part 60, Appendix A, Method 5. According to Method 5, gas is withdrawn from the duct isokinetically, and the particulate matter filtered from the gas sample. The particulate matter is determined in the rinse of the probe and nozzle, and on the filter, gravimetrically. Method 5 and Method 26A will be conducted using the same sampling train. A detailed description of the combined train is included in the QAPP.

#### **5.1.3.4 EPA Method 26A (HCl and Cl<sub>2</sub>)**

The stack gas will be sampled for determination of HCl and Cl<sub>2</sub> using 40 CFR Part 60, Appendix A, Method 26A. According to this method, sampled gas is collected isokinetically, filtered, and bubbled through a series of impingers. The gas first contacts a solution of sulfuric acid, which removes the HCl, and then contacts a solution of sodium hydroxide, which removes the Cl<sub>2</sub>. The impinger solutions are then analyzed for chloride by ion chromatography (IC).

#### **5.1.3.5 EPA Method 23 (Dioxins/Furans)**

Stack gas samples will be collected isokinetically for PCDDs/PCDFs using EPA Method 23. The sampling train consists of a gooseneck nozzle, heated probe, heated filter, sorbent module, a series of impingers, and a pumping and metering unit.

From the heated filter, sample gas enters the sorbent module. The sorbent module consists of a water-cooled condenser followed by a water-jacketed XAD-2 resin trap. Following the resin trap, the sample gas passes through a dry modified Greenburg Smith impinger that collects the aqueous condensate. The stem of this impinger is shortened to reduce carryover of collected aqueous condensate. Following the condensate trap are two impingers containing distilled, deionized water to collect any mist carryover from the condensate trap, an empty impinger and a final impinger containing a dessicant to dry the sample gas before metering. A pump and dry gas meter is used to control and monitor the sample gas flowrate.

#### **5.1.3.6 SW-846 Method 0030 (Volatile Organic POHC)**

Samples of the stack gas emissions will be collected using Volatile Organic Sampling Train (VOST) according to SW-846 Method 0030 for determination of emissions of the volatile POHC, monochlorobenzene.

In the VOST, volatile organics are removed from the sample gas in sorbent resin traps maintained at 20°C by recirculating cold water. The first resin trap contains Tenax and the second trap contains Tenax followed by petroleum-based charcoal. A dry gas meter is used to measure the volume of gas passed through the pair of traps. Approximately 20 liters (L) of sample gas will be collected on each pair of traps. A 0.5 L/m sampling rate will be used to give a nominal 40-minute sampling period per pair of traps. The samples will be collected at a fixed point in the duct.

During each test run, a VOST run will consist of collecting four pairs of traps. Three of the four trap pairs will be analyzed, with the fourth serving as a backup. All tube pairs will be analyzed separately in order to assess breakthrough.

#### **5.1.3.7 EPA Method 29 (Metals)**

Samples of the stack gas emissions will be collected isokinetically for multiple-metals according to 40 CFR Part 60, Appendix A, Method 29. The metals: arsenic (As), cadmium (Cd), total chromium (Cr), lead (Pb), mercury (Hg), and beryllium (Be) will be collected during each Test Condition.

Method 29 requires exact 100 mL volumes of the rinse reagents (HNO<sub>3</sub>, KMnO<sub>4</sub>, water, and HCl) to recover the samples and facilitate blank correction. Minor modification to Method 29 will be to use approximately 100 mL of rinseates. The exact volume (or mass) of each rinseate sample ( $\pm 25\%$ ) will be measured and recorded. The use of greater than 100 mL allows

for a more thorough recovery of the individual sample fractions. The rationale for the use of exactly 100 mL of rinseate in recovery is to ease the blank correction of the data. There are no plans to perform any blank corrections; however, should the need arise, these will be sufficient data available in the form of sample volume (or mass) measurements that will enable blank corrections to be done proportionally.

### 5.1.3.8 Continuous Emissions Monitoring (CO, O<sub>2</sub> and THC)

Redundant plant process monitors, i.e., Continuous Emissions Monitoring Systems (CEMS), will be used to monitor the concentration of CO and O<sub>2</sub> in the stack gas. Both of the extractive type CEMS are the model type ENDA 1250 manufactured by Horiba. The analyzers are located in an analyzer house near the foot of the exhaust stack. The carbon monoxide CEMS are nondestructive infrared units (NDIR). The oxygen CEMS use paramagnetic sensors. A portable total hydrocarbon THC CEMS operated according to EPA Method 25A will be used during this program.

## 5.2 Analysis Procedures

Samples collected during the CPT will be analyzed for the parameters as specified in Table 5-3. This section describes the analytical methods that will be employed. All analyses will be performed by LELAP accredited laboratories, with the exception of free alkalinity, which will be done at the site in-house laboratory. Since most of the proposed methods are standard reference methods, only brief summary type descriptions are presented. More detailed descriptions can be found in the indicated reference documents and in the QAPP (to be submitted at least three months prior to the CPT).

**Table 5-3. Summary of Analytical Methods**

Parameter	Stream	Analytical Method	Analytical Laboratory
Volatile Organic POHC	Stack Gas	GC/MS - KNOX-MS-0011 <sup>1</sup>	STL Knoxville
Dioxins and Furans	Stack Gas	HRGC/MS - SW-846 Method 8290	Alta Analytical
HCl/Cl <sub>2</sub>	Stack Gas	KNOX-WC-0005 <sup>2</sup>	STL Knoxville
Particulate Matter	Stack Gas	EPA Method 5 Gravimetric	STL Knoxville
Metals	Stack Gas Waste Feeds	ICPES - SW-846 Method 6010B CVAAS - Hg, SW-846 Method 7470A or 7471A	STL Knoxville
Organic Chloride	Process Vent	TO-14A	STL Knoxville
Composition/Physical Parameters	Waste Feeds	ASTM Standard Methods and STL Knoxville Standard Operating Procedures	STL Knoxville
Free Hydroxides	Scrubber Liquid	EPA Method 310.1, SM 2320B	Dow Analytical Lab

<sup>1</sup> STL Knoxville Standard Operating Procedure (SOP) KNOX-MS-0011 is based on SW-846 Methods 5041A and 8260B.

<sup>2</sup> STL Knoxville SOP KNOX-WC-0005 is based on EPA Method 26A.

Methods cited in this document refer to the latest promulgated method during the preparation of this document. Specific method numbers and suffix designations used in the implementation of the project will be documented in the final project report.

### **5.2.1 Composition and Physical Parameters**

Samples of the waste feeds will be collected for determination of a number of chemical and physical parameters, including:

- Ash;
- Total chlorine;
- Heating value;
- Density; and
- Viscosity.

These analyses will be performed using appropriate ASTM standard methods and STL Knoxville Standard Operating Procedures (SOPs).

Sample of cell effluent inlet and scrubber water discharge will be sampled and analyzed for Free Hydroxides using EPA Method 310.1, SM 2320B.

### **5.2.2 Stack Gas Samples for Particulate Matter Analysis**

The particulate matter concentration of the stack gas will be determined by applying 40 CFR 60, Appendix A, Method 5 protocols. The wash from the nozzle, probe liner, and glassware prior to the filter on the sampling train will be evaporated, and the mass determined on an analytical balance. The pre-tared filter will be removed from the sampling train, desiccated, and weighed to determine the mass of particulate on the filter. The combined mass from the filter and the evaporated wash are then related to the total volume of gas sampled to determine the particulate loading.

### **5.2.3 Stack Gas Samples for HCl and Cl<sub>2</sub> Analysis**

The sulfuric acid and sodium hydroxide impinger catches from Method 26A sampling will be analyzed for chloride ion concentrations. Chloride analysis will be made using the laboratory SOP KNOX-WC-0005, based on EPA Method 26A, an IC technique.

### **5.2.4 Stack Gas Samples for Dioxins and Furans Analysis**

Samples of the stack gas will be analyzed for dioxins and furans using SW-846 Method 8290, high-resolution gas chromatography (HRGC) with high-resolution mass spectroscopy (HRMS) analytical technique. The analytical protocol includes quantitation of all dibenzodioxins and dibenzofurans including four or more chlorine atoms. The method provides congener class definition for each of the five-congener groups (tetra-, penta-, hexa-, hepta-, and octa-). In addition, each individual isomer containing the 2,3,7,8-substitution pattern will be individually quantified.

#### **5.2.5 Stack Gas for Volatile POHC Analysis**

The Volatile Organic Sampling Train, VOST, will be used to collect samples of the stack gas for quantitation of volatile POHC, monochlorobenzene. The Tenax and Tenax/charcoal sorbent traps will be analyzed according to the laboratory SOP KNOX-MS-0011, based on Methods 5041A and 8260B of SW-846. Additional details related to sample prep and analysis are included in the QAPP (see Appendix B).

#### **5.2.6 Stack Gas and Waste Feed Samples for Metals Analyses**

Stack gas samples will be analyzed for five metals using inductively coupled argon plasma emission spectroscopy (ICPES) according to Method 6010B of SW-846. Target analytes for Method 6010B are As, Be, Cd, Cr, and Pb. Mercury (Hg) analyses will be performed by cold vapor atomic absorption spectroscopy according to Method 7470A of SW-846.

Waste feed streams will be analyzed for As, Be, Cd, Cr, and Pb using SW-846 Method 6010B. Mercury will be analyzed in the waste feeds using Method 7471A of SW-846.

#### **5.2.7 Process Vent Gas Samples for Organic Chlorine Analysis**

Samples of process vent gas will be collected in evacuated, passivated steel canisters. These samples will be analyzed by TO-14A for the analyte list presented in Table 8-6 of the QAPP for the determination of organic chlorine. The analyte list is derived from process information and is the complete set of possible primary chlorinated organic constituents in the process vent stream as presented in Table 2-8.

### **5.3 Process Monitoring Procedures**

The TTU is monitored to ensure that it is operating in accordance with the permitted conditions. The monitoring system was described in Section 3.2.4 and these same parameters will be monitored during the CPT.

During the performance test, the automatic waste feed cutoff system will be operational; however, certain existing AWFCO limits will be disabled during the performance testing period in order to set higher operating limits. The AWFCO limits that will be disabled for the performance test are:

- Maximum total hazardous waste feed rate;
- Minimum stack gas flow rate;
- Minimum combustion chamber temperature;
- Minimum acid absorber flow rate (freshwater make-up to acid absorber);
- Minimum chlorine scrubber flow rate (freshwater make-up to chlorine scrubber); and
- Minimum chlorine scrubber pH.

#### 5.4 Quality Assurance/Quality Control Procedures

An effective QA/QC strategy is essential to ensure the usefulness and reliability of data collected in any source testing effort. A comprehensive QA/QC protocol tailored to meet the specific needs of the program is designed. This QA/QC program is documented in a project-specific Quality Assurance Project Plan (QAPP) (see Appendix B). The QAPP details QA/QC activities for the CPT, as well as specifications for sampling and analysis activities, objectives, and procedures. The QAPP conforms to the requirements detailed in "*Preparation Aid for HWERL's Category II Quality Assurance Project Plans*," U.S. EPA, June 1987 (PA QAPjP-0007-GFS).

The primary objective of the QA/QC effort will be to provide the mechanism whereby the quality of the measurement data is known and documented and is subject to ongoing evaluation throughout the course of the project. To achieve this objective, the QA/QC program must serve two distinct, interrelated functions. One function will be that of providing a QC database, which together with performance audit results, can be used to assess measurement data quality in terms of precision and accuracy. Inherent and implied in this assessment function is a second, parallel function of controlling data quality within prescribed limits of acceptability.

The QAPP delineates specific sampling and analytical procedures, calibration requirements, internal QC checks, data reduction and validation procedures, and sample custody requirements for each sampling/analytical activity. It also addresses general QA/QC considerations such as:

- Data recording;
- Documentation procedures;

- Project organization and responsibilities;
- Preventative maintenance operations;
- Reporting requirements; and
- Corrective action mechanisms.

In addition to these general considerations, the QAPP specifies schedules for performance and the duration of sampling (especially for stack gas samples) to provide adequate method detection limits. The QAPP also devotes considerable attention to the internal QC checks that will be used to ensure that the measurement data meet data quality requirements. These QC checks include procedures such as:

- Daily calibration of analytical instruments;
- Calibration of sampling equipment and apparatus; and
- Analytical checks using QC standards and audit samples to assess bias and precision.

The following sections present a brief overview of the QA/QC activities that are an integral part of the stack test program. Table 5-4 lists specific QA/QC activities that will be performed in conjunction with the sampling and analysis from both Test Conditions.

#### **5.4.1 Sampling QA/QC**

The QAPP prescribes QC procedures to be implemented during all sampling activities and specifies guidelines for:

- Equipment calibration;
- Sampling protocol; and
- Sample handling techniques.

The checkout and calibration of sampling equipment is an important function in maintaining data quality. Referenced calibration procedures are prescribed, and the results will be properly documented and retained. Calibrations will be performed prior to field deployment.

Sampling techniques to be used during the CPT will be EPA references, "state-of-the-art" methods, or EPA draft methods, some with modifications for greater applicability. Sample collection will be done in accordance with the methods prescribed in the QAPP. The QA procedure checks will include the use of standard data forms and source sampling data sheet checklists. Other checks will include performance of the following:

- Visual inspections of sampling systems;
- System leak checks before and after sampling;

- Heating system checks;
- Impinger ice checks;
- Isokinetic sampling rate checks; and
- Daily data review and calculation checks.

**Table 5-4. Summary of Matrix-specific QC Sample Requirements<sup>1</sup>**

	Field Blank <sup>2</sup>	Trip Blank <sup>3</sup>	Break-through	Field Duplicate <sup>4</sup>	MS/MSD <sup>5</sup>	Surrogate Spike
<b>Dioxins and Furans</b>						
Stack Gas	1	1				All
<b>Volatile POHC</b>						
Stack Gas	1 per run	1	All		1- Condensate	All
<b>Particulate Matter</b>						
Stack Gas	1	1				
<b>HCl/Cl<sub>2</sub></b>						
Stack Gas	1	1			1	
<b>Metals</b>						
Stack Gas	1	1			1	
Waste Feed				1	1	
<b>Organic Chlorine</b>						
Process Vents						All
<b>Composition<sup>6</sup></b>						
Waste Feed				1	1	

<sup>1</sup> Table indicates number of QC samples planned for the trial burn, unless otherwise indicated.

<sup>2</sup> Field blanks for gas samples are recovered from assembled trains that have been leak checked but through which no gas sample has passed.

<sup>3</sup> Trip blanks consist of applicable filters, sorbents, and solutions. These will be analyzed only if necessary based on field blank analysis results.

<sup>4</sup> Field duplicates of waste feeds will be collected as duplicate sets for subsamples for compositing.

<sup>5</sup> Matrix spiked samples will be spiked prior to sample preparation (digestion/extraction), except for metals train samples, which will be spiked following digestion.

<sup>6</sup> Composition includes total Cl and ash.

After the samples have been properly obtained in the field, their subsequent handling during transfer to the analytical laboratories becomes an important factor in the successful performance of a stack test program. All collected samples will be labeled with adequate descriptions of the samples to prevent confusion among multiple samples. Samples will be inventoried against logbook records before shipment. All sample container closures will be taped to ensure against sample leakage during shipment. The frequency of performance of specific activities for this stack testing is presented in Table 5-4.

#### **5.4.2 Procedures for Analytical Quality Control**

A regime of analytical QA/QC is specified in the QAPP. The procedures will use various checks to determine the validity of analyses. These include:

- Calibration standards;
- Certified standards;
- In-lab standards;
- Blanks;
- Spikes;
- Replicates; and
- Audit samples.

QA begins with the sample log and continues through the reporting of data. The unique identifying number assigned in the field and recorded in the sample log facilitates tracking and identification and prevents mix-ups during the analysis process. Chain-of-custody reports will be used to monitor samples through analytical laboratories.

Chemical characterization of emission and process samples will be performed using standard wet-chemistry, IC, and GC/MS techniques. The accuracy and precision of analyses are documented through the QA/QC programs specified in the QAPP. Precision will be monitored by replication of analysis on 5% to 20% of samples to establish background concentrations and potential interferences. Accuracy will be evaluated by analyzing standards and blank and spiked samples. Audit samples for stack gas metals, dioxins/furans, HCl/chlorine, and VOST will also be requested from EPA and analyzed to check analytical accuracy.

## 6.0 Test Schedule

The schedule for the CPT is based upon the approval of the plan by the LDEQ. A final report of the performance test results will be submitted to the LDEQ within 90 days of completing the test.

### 6.1 Planned Test Dates

The testing will be performed within 120 days of approval of this plan.

### 6.2 Duration of Each Test

The CPT will be conducted under two test conditions. Each test condition will be identical in scope and be comprised of at least three replicate sampling runs. Each test condition will require 5 sampling trains plus CEMs to collect the planned parameters and each run will require approximately four hours to complete. Testing will therefore require a minimum of 24 hours of sampling time (12 hrs per test condition) and approximately 4 days to complete all sampling activities (2 days per test condition).

### 6.3 Quantity of Waste to be Burned

Table 6-1 presents an estimate of the quantity of materials to be burned for each test condition. The estimates are based upon the target waste feed rates identified on Tables 4-4 and 4-5 and the sampling times identified in Section 6.2.

**Table 6-1. Material Quantities**

Test Condition	Waste	Quantity		
		Rate (lb/hr)	Hours	Total (lb)
1	Glycol Ether/PDC	1,250	12	15,000
	Hexes	1500	12	34,800
	Carbon Tetrachloride	2900	12	12,000
	Process Vents	500	12	6,000
	Monochlorobenzene	60	12	720
	Ash spike	1.2	12	13.2
	Lead spike	0.0030	12	0.036
	Chromium spike	0.0125	12	0.15
	Mercury spike	0.0020	12	0.0240
2	Glycol Ether/PDC	1,300	12	15,600
	Carbon Tetrachloride	5,100	12	61,200
	Monochlorobenzene	60	12	720
	Ash spike	3.5	12	42
	Lead spike	0.006	12	0.072
	Chromium spike	0.025	12	0.30
	Mercury spike	0.004	12	0.048

#### 6.4 Detailed Schedule of Planned Test Activities

The CPT test is scheduled to be completed over a period of 4 days, with a total sampling time of 48 hours. One to two sampling runs are scheduled to be completed each day of testing, so a total of two testing days per test condition will be required. Additionally, a day for setup and a day for demobilization/contingency have been scheduled for a total CPT test duration of up to six days.

Prior to the CPT test, process instruments will be calibrated, and the AWFCOs will be tested. The planned daily activities for the CPT test are as follows:

- Day 1 – Sampling team will mobilize to site and setup/checkout equipment. Coordination meeting will be conducted.
- Day 2 – The system will be brought to the desired steady-state operating conditions while the sampling team completes preparations for conducting the first run for Test Condition 1. When all preparations are complete, sampling will begin and will continue, with only short interruptions for port changes and leak checks, until the run is complete. The second run will be started as soon as possible after completion of the first run if time and circumstances allow.
- Day 3 – The system will be brought back to the same steady-state operating conditions as the previous day. Meanwhile the sampling team completes preparations for conducting the remaining runs for Test Condition 1. When all preparations are complete, sampling will begin and will continue, with only short interruptions for port changes and leak checks, until the run is complete. At the conclusion of the third run, Test Condition 1 will be completed. Time permitting, if the unit can be brought to the desired operating conditions for Test Condition 2 and steady-state conditions can be achieved, the first run of Test Condition 2 may be started on Day 3.
- Day 4 – The system will be brought to the desired steady-state operating conditions while the sampling team completes preparations for conducting the first (or second) run for Test Condition 2. When all preparations are complete, sampling will begin and will continue, with only short interruptions for port changes and leak checks, until the run is complete. If time and circumstances allow, the next run will be started as soon as possible after completion of the first run of the day.
- Day 5 – If necessary, the system will be brought back to the same steady-state operating conditions as the previous day. Meanwhile the sampling team completes preparations for conducting the remaining run for Test Condition 2. When all preparations are complete, sampling will begin and will continue, with only short interruptions for port changes and leak checks, until the run is complete. At the conclusion of the third run, Test Condition 2 will be completed.
- Day 6 – Demobilization of equipment and test crews. Contingency day.

## **Appendix A**

### **Continuous Monitoring System Performance Evaluation Test Plan**

**Continuous Monitoring Systems  
Performance Evaluation Test Plan  
Solvents/EDC I Thermal Treatment Unit**

**The Dow Chemical Company**

**Prepared for:**

**The Dow Chemical Company  
P.O. Box 150  
Plaquemine, Louisiana 70765**

**Prepared by:**

**URS Corporation  
9400 Amberglen Boulevard (78729)  
P.O. Box 201088  
Austin, Texas 78702-1088**

**Revision 1  
August 2008**

## Table of Contents

	Page
1.0 Introduction.....	1-1
2.0 Performance Evaluation Test Plan Objectives.....	2-1
3.0 Continuous Monitoring Systems (CMS) Description.....	3-1
3.1 Process Parameter CMS.....	3-1
3.2 Continuous Emission Monitoring Systems (CEMS).....	3-1
3.3 Data Management.....	3-1
4.0 Performance Evaluation Program Summary.....	4-1
4.1 Process Parameter CMS.....	4-1
4.1.1 Installation.....	4-1
4.1.2 Calibration.....	4-1
4.1.3 Operation and Maintenance.....	4-1
4.1.4 Automatic Waste Feed Cutoff (AWFCO) System.....	4-1
4.2 Continuous Emission Monitoring Systems (CEMS).....	4-2
4.2.1 Installation.....	4-2
4.2.2 Calibration and Performance Testing.....	4-2
4.2.2.1 Calibration Error (CE).....	4-2
4.2.2.2 Relative Accuracy (RA).....	4-3
4.2.3 Operation and Maintenance.....	4-3
4.2.4 Automatic Waste Feed Cutoff (AWFCO) System.....	4-3
5.0 Performance Evaluation Schedule.....	5-1
6.0 Quality Assurance Program.....	6-1
6.1 Data Quality Objectives (DQOs).....	6-1
6.2 Internal Quality Assurance.....	6-1
6.3 External Quality Assurance.....	6-1

## List of Tables

3-1 Solvents/EDC I TTU Major Process Instrumentation.....	3-2
---	-----

## 1.0 Introduction

The Dow Chemical Company (Dow), Louisiana Operations operates a chemical manufacturing plant in Plaquemine, Louisiana. The facility operates the F-700 Thermal Treatment Unit (TTU) under permits issued by the Louisiana Department of Environmental Quality (LDEQ). The F-700 treats RCRA hazardous waste under Permit No. LAD008187080. The F-700 is in compliance with the interim standards of the National Emissions Standards for Hazardous Air Pollutants (NESHAPs) for Hazardous Waste Combustors (40 CFR 63 Subpart EEE), and is also conducting a CPT to show compliance with the permanent replacement standards of the HWC MACT. The standards required by this rule are based on maximum achievable control technology (MACT) more commonly known as the Hazardous Waste Combustor (HWC) Maximum Achievable Control Technologies (MACT).

The HWC MACT addresses the use of continuous monitoring systems (CMS) to demonstrate compliance with applicable operating parameters and emission standards. The CMS can be divided into two types: continuous emission monitoring systems (CEMS), which measure stack gas concentration (e.g., carbon monoxide, oxygen) and process parameters CMS, which measure process operating parameters from the combustor and the associated air pollution control system (e.g., thermocouples, flow meters, pH probes). This Continuous Monitoring System (CMS) Performance Evaluation Test Plan (PETP) describes how Dow intends to conduct an initial CMS Performance Evaluation Test for the F-700 to assess the performance of the continuous monitoring systems in fulfillment of the requirements of 63.1207(e).

## **2.0 Performance Evaluation Test Plan Objectives**

In order to comply with 40 CFR 63.1207(e) of the HWC MACT, Dow has prepared a CMS Performance Evaluation Test Plan (PETP). The objective of this site specific CMS-PETP is to demonstrate that components of the CMS are installed, calibrated and collecting quality data during operation of F-700. Dow will use appropriate promulgated performance specifications provided in 40 CFR Part 60 Appendix B for CEMS. Because no performance specifications exist for process parameter CMS, manufacturer's written specifications or recommendations will be used as a minimum.

Dow will also perform an automatic waste feed cutoff (AWFCO) system test to verify that the CMS is properly interlocked.

This CMS PETP was developed in accordance with 40 CFR 63.8(d) and (e) of the MACT General Provisions.

### **3.0 Continuous Monitoring Systems (CMS) Description**

The F-700 uses both process parameter CMS and CEMS. Descriptions of the process parameter CMS and CEMS are provided in the following sections.

#### **3.1 Process Parameter CMS**

The F-700 uses process instruments, which include thermocouples, flowmeters, pH meters, and pressure transmitters to document compliance with applicable operating parameters. The process instruments continuously monitor and record operating parameters of F-700. The process instruments used to monitor operating parameters required by the HWC MACT are listed in Table 3-1. The locations of these process instruments are shown in Figure 3-1 of the Comprehensive Performance Test Plan.

#### **3.2 Continuous Emission Monitoring Systems (CEMS)**

Carbon monoxide is monitored using a dual range monitor spanned from 0-200 ppmv, and 0-3,000 ppmv. Upon compliance with the HWC MACT, the low range will be 0-200 ppmv and the second range will be 0-3,000 ppm. The O<sub>2</sub> analyzer has a range of 0-25%. Both redundant CEMS are equipped with Horiba model type ENDA 1250 analyzers. The carbon monoxide analyzer is a nondestructive infrared unit (NDIR), and the oxygen analyzer uses paramagnetic sensor to detect oxygen concentrations in the stack gas.

#### **3.3 Data Management**

The process instruments and analyzers transmit operating data to a data acquisition and management system (DA/MS) that performs the required data manipulations and calculations. The DA/MS will compare computed values to the respective AWFCO limits. Process data is recorded in the facility computer database that is a part of the facility operating record.

As defined in 40 CFR 63.1209(b)(3) of the HWC MACT, the process instruments monitor the regulated parameters without interruption. The DA/MS system evaluates the instrument response at least once every 15 seconds and computes and records the average values at least every 60 seconds. The calculations of rolling averages are performed as defined in 40 CFR 63.1209(b)(5).

The DA/MS does not use data collected during instrument calibration periods in the rolling average calculations. Once one-minute data is available again, the first one-minute data is added to the previous one-minute data to calculate rolling averages. Waste feeds are taken offline for non-redundant instrument calibration.

**Table 3-1. Solvents/EDC I TTU Major Process Instrumentation**

Operating Parameter	Location	Sensor	Ref. No. 1	DCS Tag No.	Equipment ID No.	Instrument Range	Minimum Acceptance Criteria <sup>2</sup>
Combustion Chamber Temperature Probe (West)	R-700 west side	Thermocouple	4	TT-6531	AI-5116	0-1,600°C	+/- 1% of Span
Combustion Chamber Temperature Probe (South)	R-700 south side	Thermocouple	5	TT-6532	AI-5106	0-1,600°C	+/- 1% of Span
Steam Pressure to Hex Nozzle	Steam line to hex nozzle	Pressure Transmitter	6	PT-6438	AI-5110	0-200 psig	+/- 1% of Span
Hex Feed Flow	Hex line	Flow Meter	7	Note: Calculated.	AI-5154, AI-5122	0-10,000 lb/hr	3% of Rate
				FT-0853-19A, FT-0853-19B			
EDC I Heavies Feed Rate	EDC I Heavies line	Flow Meter	8	FT-6262	AI-5152	0-2,200 lb/hr	+/- 1% of Span
Solvent Heavies Feed Rate	West of D701	Flow Meter	9	FT-6208	AI-5121	0-3,000 lb/hr	+/- 1% of Span
Glycol I Feed Rate	Glycol I Feed Line	Flow Meter	10	FT-6271	AI-5111	0-2,900 lb/hr	+/- 1% of Span
"Taffy" Feed Rate	Taffy pots	Flow Meter	11	FT-6427	AI-5151	0-6,000 lb/hr	+/- 1% of Span
Slim Nozzle Feed Rate	Slim line	Flow Meter	12	FT-6264	AI-5131	0-3,000 lb/hr	+/- 1% of Span
General Waste Feed Rate	General Waste Tank	Flow Meter	13	FT-6382	AI-5101	0-2,500 lb/hr	+/- 1% of Span
D-42 Vent Flow Rate	D-42 vent	Flow Meter	14	FT-6385	AI-5145	0-200 lb/hr	+/- 1% of Span
K-102 Vent Flow Rate	K-102 vent	Flow Meter	15	FT-6488	AI-5150	0-155 lb/hr	+/- 1% of Span
D-700 Vent Flow Rate	D-700 vent	Flow Meter	17	FT-6340	AI-5127	0-1,400 lb/hr	+/- 1% of Span
D-702 Vent Flow Rate	D-702 vent	Flow Meter	18	FT-6450	AI-5112	0-3,000 lb/hr	+/- 1% of Span
Slim Nozzle Steam Pressure	Steam line to slim nozzle	Pressure Transmitter	19	PT-6446	AI-5120	0-200 psig	+/- 1% of Span
Air Pressure to "Taffy" Nozzle	Air line to taffy nozzle	Pressure Transmitter	20	PT-6431	AI-5125	0-100 psig	+/- 1% of Span
Steam Pressure to General Waste Nozzle	General Waste Tank	Pressure Transmitter	21	PT-6453	AI-5130	0-200 psig	+/- 1% of Span
C-730 Discharge pH	C-730 drain line	pH probe	22	AT-6701, AT-6702	AI-5246, 5234	0-14 pH	+/- 1% of Span
River Water Flow to C-730	River H <sub>2</sub> O line to C-730	Flow Meter	23	FT-6706	AI-5248	0-1000 gpm	+/- 1% of Span
Process Water Flow to C-720	Process H <sub>2</sub> O line to C-720	Flow Meter	24	FT-6660	AI-5238	0-1000 gpm	+/- 1% of Span
C-730 Pressure Drop	Across packing in C-730	Differential Pressure transmitter	25	DPT-6704	AI-5233	0" - 25"	+/- 1% of Span
C-720 Pressure Drop	Across packing in C-720	Differential Pressure transmitter	26	DPT-6652	AI-5232	0" - 25"	+/- 1% of Span
Caustic Flow to C-730	Above C-730	Flow Meter	27	FT-6710	AI-5236	0-35 gpm	0.3% of Rate
Stack gas flow rate	Stack	Flow Meter	30	FT-0877-00	AI-5269	0-6000 ACFM	+/- 1% of Span
O <sub>2</sub> Analyzer	Stack	Paramagnetic	28	AT-87601B/AI-229; AT-87601A/AI-239		0-25%	3% of Span
CO Analyzer	Stack	IR Analyzer	29	AT-87602A/AI-230, AT-87602B/AI-240		0-200 ppm 0-3,000 ppm	3% of Span

<sup>1</sup> These reference numbers are used to identify the locations of these monitors in Figure 3-1 of the Comprehensive Performance Test Plan.

## **4.0 Performance Evaluation Program Summary**

Dow's Performance Evaluation Program has the objective of ensuring that components of the CMS are installed, calibrated, operated, and maintained so that valid operating data is collected to demonstrate F-700's compliance with the HWC MACT. As part of this program, Dow will conduct a test that will use appropriate promulgated performance specifications for CEMS provided in 40 CFR Part 60 Appendix B. Because no performance specifications exist for process parameter CMS, manufacturer's written specifications or recommendations will be used as a minimum.

Due to the history of the May 2005 CPT and subsequent modifications to the unit (new air blower, variable speed drive, flue gas recirculation line, and 2 gas flow meters in ports A and B respectively, performance of stack gas flow meters over a range of flow gas rates will be demonstrated according to EPA Performance Specification #6 prior to performing the CPT.

### **4.1 Process Parameter CMS**

#### **4.1.1 Installation**

As defined in 40 CFR 63.8(c)(2), all CMS shall be installed such that representative measurements of process parameters from the affected source are obtained. Dow has installed all process parameter CMS per manufacturer's written specifications or recommendations to obtain representative measurements.

#### **4.1.2 Calibration**

CMS components will be calibrated using manufacturer's written specifications or recommendations. Instrument calibration will be part of Dow's CMS performance evaluation test required under the HWC MACT. All instruments that are used to demonstrate compliance with applicable process operating parameters will be calibrated within 90 days before the Comprehensive Performance Test (CPT).

#### **4.1.3 Operation and Maintenance**

CMS components will be operated and maintained by using manufacturer's written specifications or recommendations.

#### **4.1.4 Automatic Waste Feed Cutoff (AWFCO) System**

The CMS process parameters are integrated with the AWFCO system. The AWFCO system operates on a continuous basis and is designed for a partial system shutdown, which discontinues hazardous waste feed to the TTU whenever one or more operating parameter or emission limits is exceeded. In addition, if the span of any process parameter CMS is exceeded, this will initiate an AWFCO. These limits exist to ensure that F-700 is operating properly to meet compliance emission standards. Any attempt to operate outside of these limits will trigger an AWFCO. The AWFCO system will be set at just below allowable limits to avoid any exceedances. During an AWFCO, the control system activates an alarm and interrupts the hazardous waste feed to F-700. Hazardous waste feed to F-700 will not resume until all parameters are within proper operating limits.

Testing of the AWFCO system will be performed during Dow's CMS Performance Evaluation Test.

## **4.2 Continuous Emission Monitoring Systems (CEMS)**

Performance Evaluation of Dow's CO and O<sub>2</sub> CEMS will follow 40 CFR Part 60 Appendix B Performance Specification 4B – "Specifications and Test Methods for CO and O<sub>2</sub> CEMS in Stationary Sources." The Performance Evaluation test will demonstrate that the CO and O<sub>2</sub> CEMS meet performance criteria. The CEMS QA/QC Plan, required under the HWC MACT, will contain more detail on the CEMS operation. The CEMS QA will refer to 40 CFR Part 60 Appendix B - "Quality Assurance Procedures".

### **4.2.1 Installation**

As defined in 40 CFR 63.8(c)(2), all CEMS have been installed such that representative measurements of emissions from the affected source are obtained. Dow has installed CO and O<sub>2</sub> CEMS according to Performance Specification 4B.

### **4.2.2 Calibration and Performance Testing**

The CEMS Performance Evaluation includes four elements. Each element is described in the following sections and includes:

- Calibration Error,
- Relative Accuracy.

The CEMS will be up-to-date with respect to daily, quarterly (ACA) and yearly (RA) calibration requirements before the Comprehensive Performance Test.

#### **4.2.2.1 Calibration Error (CE)**

A CE test compares the difference between the concentration indicated by the CEMS and the known concentration of cylinder gases (zero, mid, and high). A CE test procedure is performed to document the accuracy and linearity of the monitoring equipment over the entire measurement range.

#### **4.2.2.2 Relative Accuracy (RA)**

A RA test is a comparison of the CEMS response to a value measurement by a standard Reference Method (RM). The RA test is used to validate the calibration technique and verify the ability of the CEMS to provide representative and accurate measurements.

The RA test will be conducted while the affected facility is operating at more than 50% of the normal load. The RM tests will be conducted in such a way that the results will be representative of the emissions from the source and can be correlated to the CEMS data. A minimum of nine RM tests must be used to determine the RA. More than nine RM tests may be performed, however, a maximum of three tests may be rejected from the RA determination and all test results must be reported.

#### **4.2.3 Operation and Maintenance**

CEMS will be operated and maintained in accordance with Performance Specification 4B and manufacturers written specifications or recommendations.

#### **4.2.4 Automatic Waste Feed Cutoff (AWFCO) System**

The CEMS are integrated with the AWFCO system. The AWFCO system operates on a continuous basis and is designed to cut off hazardous waste feed when one or more AWFCO parameters exceed allowable limits. These limits exist to ensure that F-700 is operating properly to meet compliance emission standards. Any attempt to operate outside of these limits will trigger an AWFCO. During an AWFCO, the control system activates an alarm and interrupts the hazardous waste feed to F-700. Hazardous waste feed to F-700 does not resume until all parameters are within proper operating limits.

Testing of the AWFCO system will be performed during Dow's CMS Performance Evaluation Test.

## 5.0 Performance Evaluation Schedule

The CMS PETP will be performed in accordance with manufacturers written specifications or applicable EPA promulgated Performance Specifications. The process parameter CMS and CEMS will be tested concurrently. The testing will be performed within one month prior to the CPT.

## **6.0 Quality Assurance Program**

### **6.1 Data Quality Objectives (DQO)**

The CMS components will be maintained to provide accurate and precise results. Accuracy objectives for the CMS components are provided in Table 3-1. The completeness objective for the collection of CMS data during the test is 95%.

### **6.2 Internal Quality Assurance**

The internal quality assurance program will include the activities planned by routine operators and analysts to provide assessment of CMS performance. This program will contain the following:

- Daily walk through audits (WTA) to check operational status of the CMS and to make necessary adjustments;
- Daily calibration drift checks to verify the CEMS accuracy; and
- CMS calibration tests to verify components are capable of meeting performance criteria.

In addition, a daily calibration check is performed automatically through the plant's process computer. A printout is generated daily which calculates the calibration drift and alarms in the control room if the calibration checked is outside the performance requirements. When the calibration check fails, a calibration is performed. Also, the generating of this data shows that the data acquisition system and the recording system are operating correctly. The control panel warning lights are also checked each day. The sample transport system and interface are checked when needed.

### **6.3 External Quality Assurance**

The external quality assurance program will include system audits that include the opportunity for on-site evaluation by the Administrator of instrument calibration, data validation, sample logging, and documentation of quality control data and field maintenance activities. This program will contain the following:

- Quarterly Cylinder Gas Audits (CGA) for CEMS to provide a more rigorous and independent assessment of CEMS accuracy and reliability than is provided by the daily calibration;

- Annual Relative Accuracy Test Audits (RATA) for CEMS to provide a more rigorous and independent quality assurance assessment of the CEMS accuracy and reliability than is provided by quarterly CGA;
- Review of CMS calibration, operation and maintenance procedures; and
- Review of calibration, operation and maintenance facility records.

## **Appendix B**

### **Quality Assurance Project Plan**